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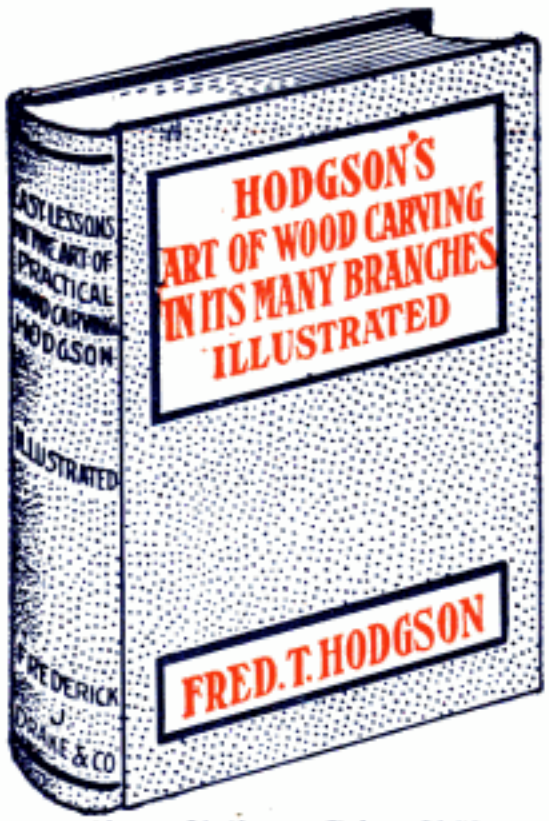

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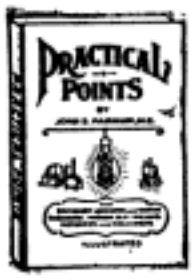

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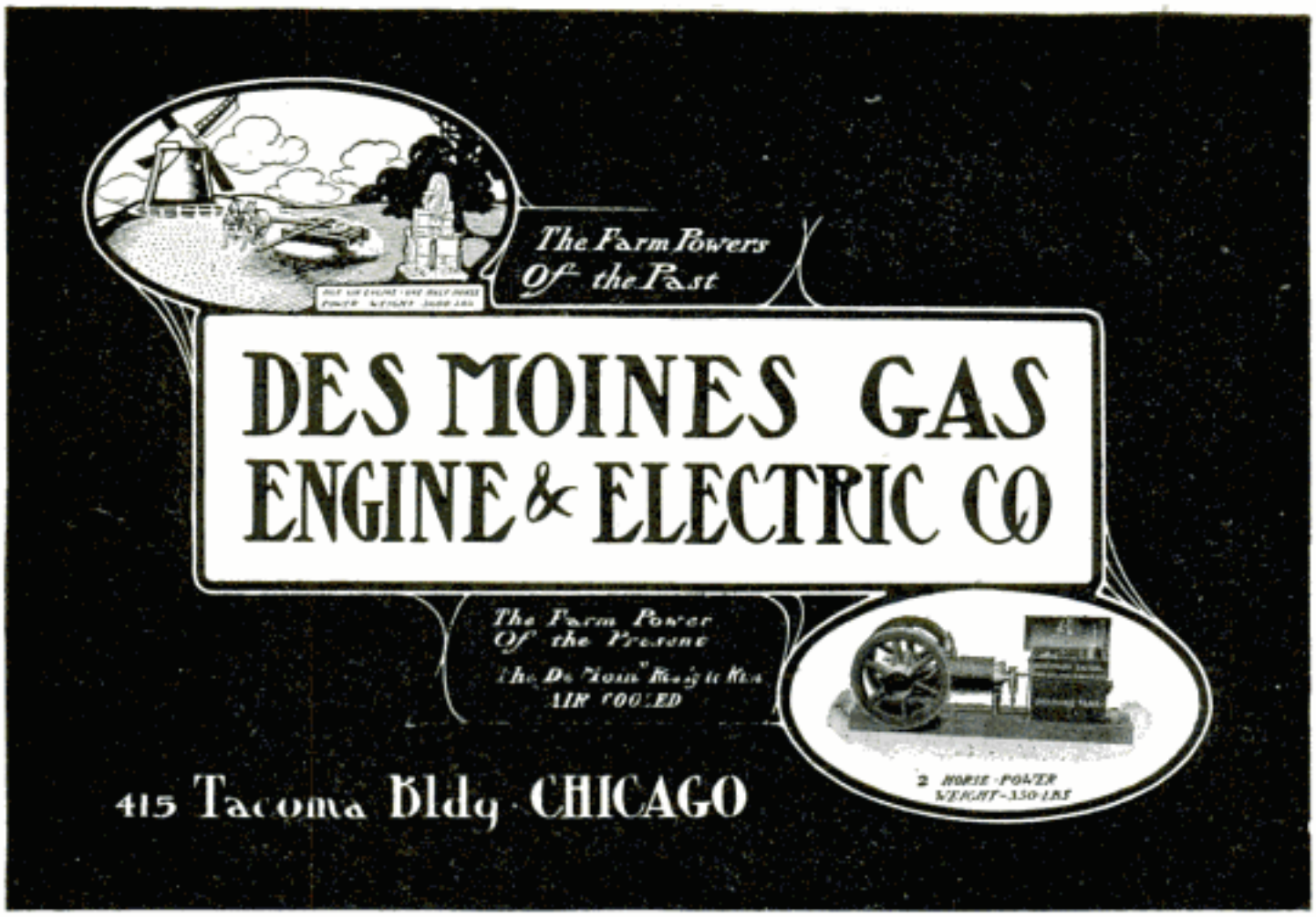

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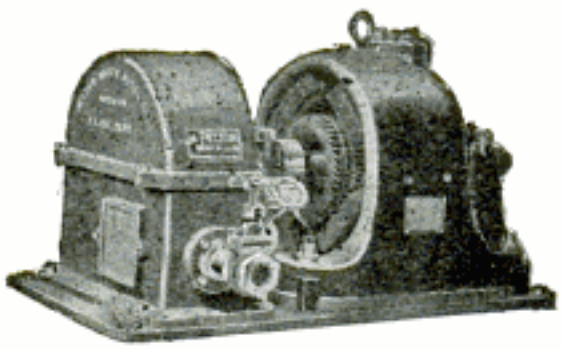

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POPULAR MECHANICS

Vol 7. No. 7. CHICAGO, JULY, 1905. 10 Cents a copy. $1.00 a year.

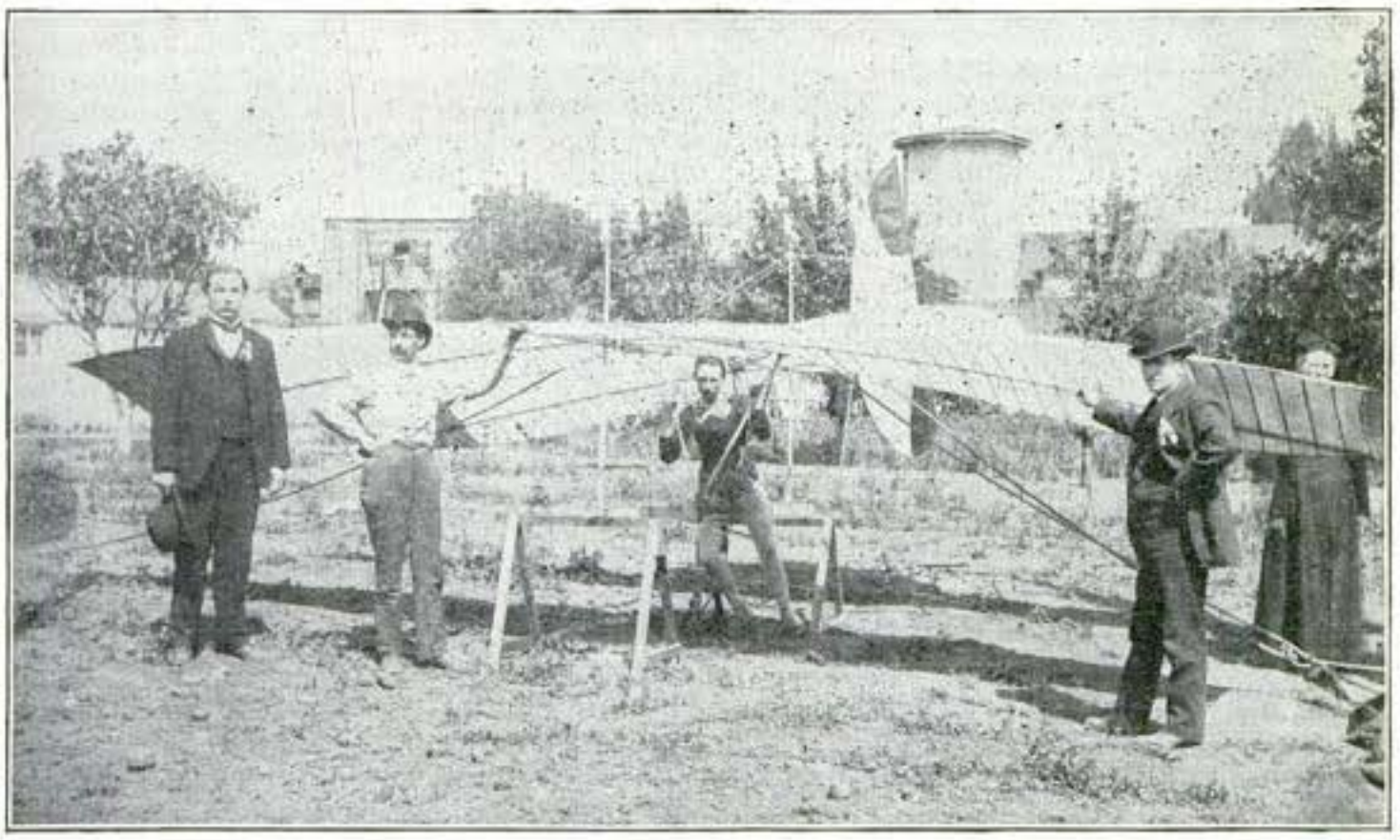
THE MONTGOMERY AEROPLANE

Details of the California Air Craft Which Is Attracting World-Wide Attention.

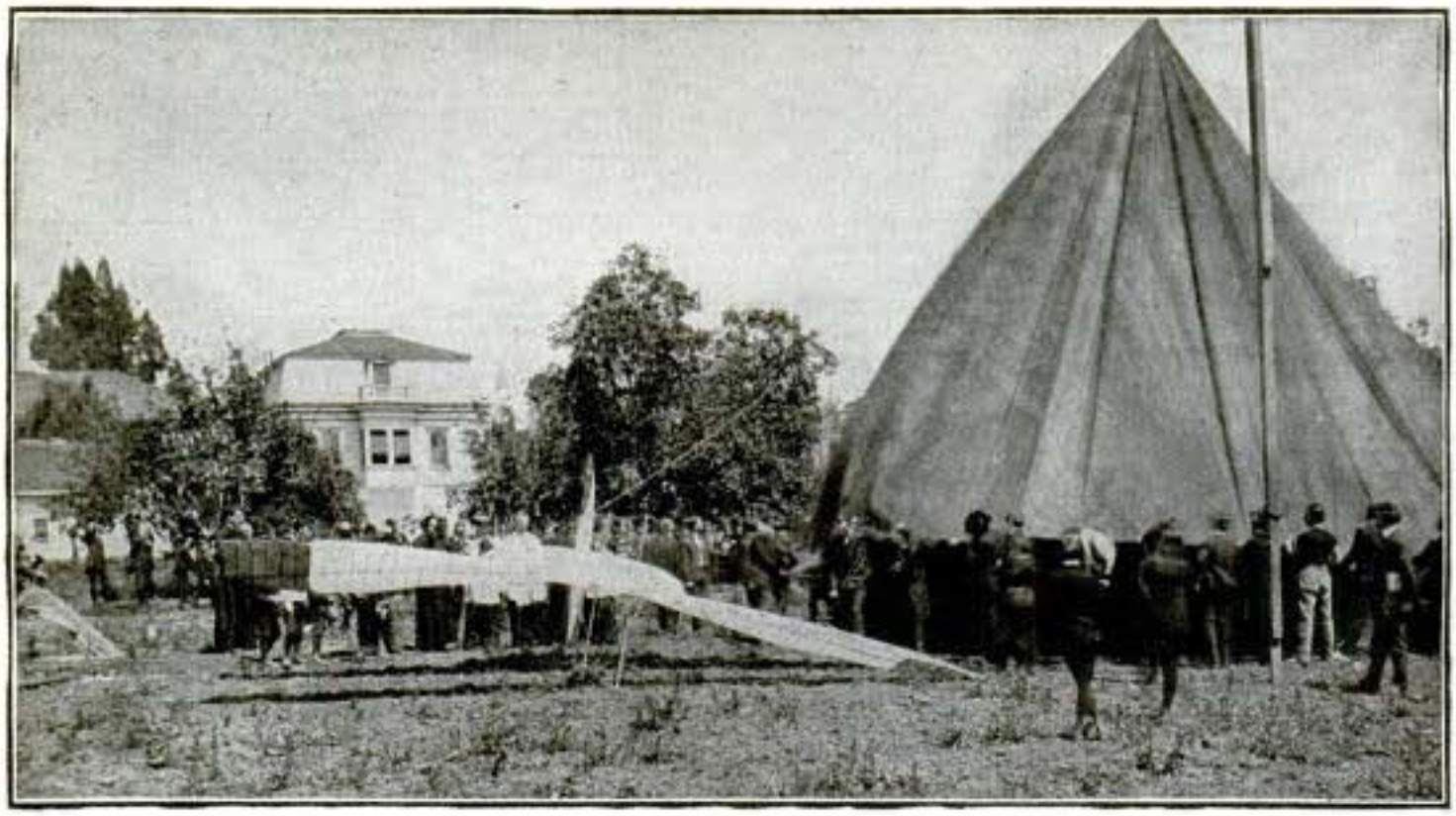
By Prof. Dennis J. Kavanagh, S. J., Chief of Editorial Department, Santa Clara College.

Prof. Montgomery.

The Santa Clara College, near San Jose, California, or as it is generally spoken of on the coast, the Santa Clara Mission, is an important institution in the Catholic work. It was founded over 200 years ago by Jesuit missionaries from Spain, who brought with them some of the material for its erection. The vine-covered roof tiles now covering several of the buildings were brought from Spain two centuries ago. A high stone wall which is in its second century incloses the college buildings, and spacious grounds filled with all manner of rare and beautiful trees and shrubs. The chapel contains one of the largest and finest paintings in this country. The Fathers take great delight in showing visitors about the grounds and buildings on those days when the college is open to the public. It is an interesting coincidence that the latest and perhaps the most promising of twentieth century achievements in navigating the air should find its inception and execution amid scenes which are at once so historic and to so large an extent old-world.—Editor's Note.



Machine Ready for Flight.—At the Right Stands Prof. Montgomery.



Ceremony of Blessing the Air-Ship Before First Trial--Balloon to Raise it Partly Inflated

Professor John J. Montgomery of Santa Clara College, Cal., claims that he has made one important step towards eventual success in aviation. Some of those who saw the experimental flights of March 16, 18 and 20, and the public exhibition of April 29, go much further than the professor and maintain that he has solved one-half, and by far the more difficult half, of the problem that has vexed the scientific world for many years. He has indeed constructed a machine which, on four different occasions, ploughed the air gloriously and majestically and, what is much more important, with perfect safety. His machine was, moreover, directed by an aeronaut and showed evidence of self-propelling power.

To those who know anything of the difficulties involved, this much will appear as more than one step; it is a gigantic stride, a rush into the midst of things. Lilienthal glided and Chanute glided from elevated heights; but the former was killed and the latter has taken prudent precautions not to soar too high and to have a sandy tract to fall upon in case of capsizing or other accident. Mr. Montgomery has gone beyond that crucial period; his first experiments were with models, constructed on the same plan and carrying, proportionately, the same weight as his larger machines. It was by means of these models that he gained the confidence of the aeronaut and no little degree of confidence is necessary before a man entrusts himself to an apparently frail mechanism, 4,000 feet above terra firma. When, however, the inventor gave his demonstration with models and predicted every move and every turn nothing more was necessary. The aeronaut ascended by means of a balloon, cut loose and glided downwards in perfect safety.

All that is now wanting for complete success is a power, in the machine itself, to rise from the earth. This point has not yet been attempted by Mr. Montgomery, for the simple reason that to his scientific mind, it would seem too much like greed, too much like ambitioning all or none and being left empty-handed in the end. "Why attempt to rise from earth, before we are sure of ourselves when in the air?" That was the principle with which he began his research.

This example illustrates perfectly the nature of Mr. Montgomery's invention. He has succeeded in getting a machine which floats on the air, with perfect security, because it is possessed of perfect equilibrium. He has a dirigible machine and one that has in itself a certain amount of motive-power. Of course it eventually drops to the earth and the unscientific wonder where the "flying" has come in; but when Professor Chanute heard that the aeronaut directed his downward course in safety, avoiding house-tops and electric wires and trees and that he landed in a field previously chosen, he wrote congratulations and felicitations to the inventor and said that the experiment was "the greatest and most daring feat ever

attempted in gliding flight." And Alexander Graham Bell is reported as having said publicly, "The Montgomery machine will centralize all future experiments; with it subsequent investigations must begin."

And no wonder. Here are some simple, straightforward facts of personal observation. Without any wish to exaggerate I almost feel that I have not the power. A plain statement of what was done will be enough for my purpose. From an elevated tower I saw the aeronaut rise high into the air, four thousand feet at least. When at that height he cut loose from the balloon and paused, motionless, it almost seemed, above the town of Santa Clara. He then directed his course against the wind and hovered over the spot whence he had ascended. It was an apparent struggle, this motion against the wind, but it was accomplished. When the aeronaut turned around he was carried like a meteor in the opposite direction and all who saw him and understood not the power of the machine thought that there would be no more turning, no more gliding, but that caught in the whirl he would be blown Heaven knew where. He did turn, however, and approached the upward-lookers, approached them by three hundred yards, guessing roughly, and then darting out at a right angle to the wind, he paused, actually came to a standstill, that is, as far as onward progress was concerned, and to culminate all, he began to ascend. He did not succeed in mounting very many yards, but if my eyes and those of the hundreds of on-lookers were in proper condition, he did actually ascend. It was a rebound of the winged surface from the air, effected by certain manipulations.

So far all was phenomenal; the final dive for the open field was even more so. The aeronaut was easily 1,000 feet above the earth when he determined to alight. The field selected for this purpose was at an angle of 45 degrees from him, while immediately below there was a lumber mill with countless obstacles around about. It made no difference, however; the aeronaut arranged matters for a descent and much like a bird of prey, he dove for the field, gathering velocity as he went. When within one hundred feet of the field he had momentum sufficient to drive the machine deep into the

Note the Extreme Lightness of the Wings--The Roof Tiles Seen on the Building in the Corner Came from Spain in the 17th Century

earth and to break every bone in his body. It caused a feeling of horror in all who beheld the scene; but the horror was but momentary, for by a sudden turn, he was again gliding calmly and tranquilly on the air and a moment after he alighted as easily as a bird, folded his wings and started back to Santa Clara College, whence he had ascended.

Many who read this account will jump at all sorts of conclusions as to the nature of the machine. To prevent empty conjectures here is a detailed account. The machine weighs just forty-eight pounds; it consists of a wooden frame, two sets of wings and a peculiarly shaped rudder or tail. It was constructed by Professor John J. Montgomery

View Showing Tail or Rudder

in person and, barring the labor, it cost not more than ten dollars. But there is science in it and that is what enables the aeronaut to soar, to steer, to glide at pleasure. The machine could be built in one day; but the plan required twenty-five years of thorough scientific work.

Mr. Montgomery is above all things else a scientist. He studied physics and mathematics all through life; he was a member of the Aeronautical Congress and of the Congress of Electricians at the World's Fair in Chicago in 1893; he has taught since that time at Mt. St. Joseph's College, and at Santa Clara. Flying has been for him only a side-study, a while-away-the-time occupation. He brought to it, however, the clear, logical mind which he inherited from his father, the Hon. Zach Montgomery, assistant district attorney of the United States under Cleveland, and, bringing such a mind, he succeeded where others failed.

This is the way he went about the problem. A youth on his father's farm in San Diego in 1880 he interested himself in all manner of science; a passionate lover of hunting, he had ample opportunity to observe the flight of birds and he often wondered why it was that they could fly, whole flocks of them weighing at times over a thousand pounds, and man could not. He set himself to study the phenomenon and his study was at once deep and along the proper lines. After varied researches he came to this conclusion: that a bird on wing is not the only element to be reckoned with; there must be a reciprocal action between the bird and the air and the idea of reciprocal action led him to conclude that the problem of flight would be best solved by starting out with the principle that the bird and the surrounding air form a system. It was easy enough to approximate the surface-shape of a wing; what remained was an intimate acquaintance with the action and re-action of the other element in the system—the air.

Mr. Montgomery spent many years in the study of this problem, principally by means of experiments in liquid movements, and from his study he drew various and strikingly novel conclusions. Principal among these conclusions were: (1) That a surface to act upon the air and to be acted upon by the air, in such a manner as to sustain a human body, must be so formed and adjusted that it will produce certain rotary movements in the air; (2) that the parts of the surface must be co-ordinate, so that a change in one part will produce a corresponding change in other parts, and consequently act upon the air so as to induce various modifications of air movement.

On these two principles, established long since, Mr. Montgomery built his aeroplane, which we have already, in part, described and which we may now study in the light of the underlying principles. His aeroplane consists, as may be seen in the photographs, of two distinct wing-surfaces, so placed as to form a parabolic surface from the front to the rear edge. Then there is what we may call a tail consisting of a vertical and a horizontal plane. The purpose of all this may be stated thus. The wings are divided so as to produce a general rotation in the air, the rear portions are so arranged that they are free to change in position, either automatically, when under excessive atmospheric pressure, or devisedly when the aeronaut is directing his course. There is the further mechanical arrangement that when on one side the wing is tilted, on the other it will take an opposite position so that in consequence there will be on either side an opposite but reciprocal change.

The tail which has an influence on the entire mechanism, consists of a vertical and a horizontal plane surface; the vertical portion serving to secure side equilibrium and to meet antagonistic pressures from above and below the surfaces; while the horizontal is used to assure fore and aft equilibrium and as a necessary element for downward or upward or horizontal motion.

These various mechanical devices enable the aeronaut to descend in circles, to stand still momentarily, to check his speed when excessive, to turn with or against the wind, to take a gradual descending motion and to alight with perfect ease, either on a housetop or in an open field. And the wonder of it all is, that, when he has alighted, he can fold his machine and start homeward with the wings and frame-work on his shoulders.

Further developments are certainly necessary to secure a perfect flying-machine; but as already stated, now and now only are we justified in talking of developments. We have a machine that will navigate the air in safety, that can turn, glide, soar and plunge under the proper manipulation. The inventor has not been unmindful of these possibilities, but he is loth to ambition too much at a time. He is perfectly satisfied with present results and, were his success to end there, he would be satisfied; still he has a scheme for self-elevation on which he intends to work later. If his new ideas realize shall we not have an invention equal to any in history?

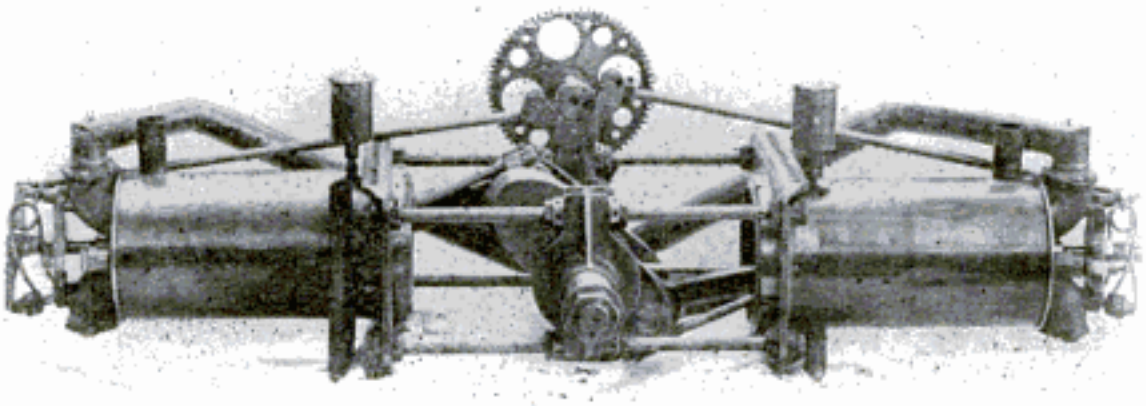
POWER FOR AIR-SHIPS.

Great Progress Being Made--Lightest Engine in the World

By C. E Duryea, President Duryea Power Co.

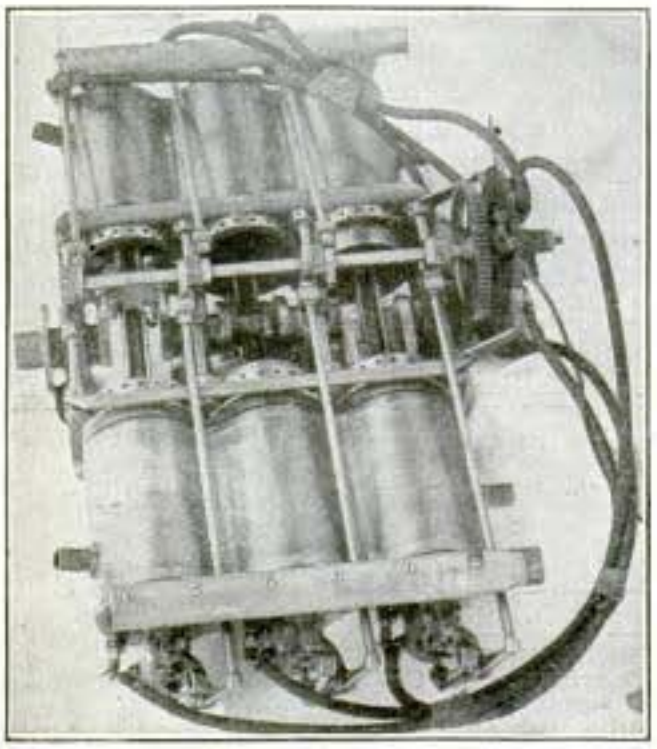
The development of improved motors for auto service has done much to encourage experimenters in the various methods of aerial travel. The one great pressing need at this time is a motor, positive in action,—for when a mile above the earth a man cannot stop to adjust things as he may on a country road —and which shall yield a maximum of power with a minimum of weight. In the construction of air craft the great effort is to eliminate every ounce of weight possible. The writer has for years thoroughly believed in the ultimate solution of the aerial navigation problem, and to this end has devoted much time and experiment to the construction of an aerial motor. If one compares the motors offered for this work today, with the best to be obtained only five years ago, he will not only be astonished at the progress made, but will realize that we are rapidly approaching the time when an aerial motor will be well adapted to its work as are the best auto powers at present.

We believe we have now produced an aerial engine which is the lightest in the world, not even excepting the motors used by Santos Dumont. One photograph shows a two-cylinder motor which weighed as photographed less than 100 lbs., and which developed between 15 and 16 hp. at about 1,000 revolutions per minute. The six-cylinder motor without much tuning up developed over 40 hp. and could doubtless have been carried up to 45 hp. or beyond, were it not for the fact we had already given the power required. This motor as shown



Lightest Engine in the World

weighs about 200 lbs. and when installed for flight will not exceed 232 lbs. These motors use cast iron cylinders machined inside and out, with copper water jacket, clamped in position. They were ignited by jump spark from a single coil using dry cells. The six-cylinder motor has triple



Six-Cylinder Air-Ship Engine

throw crank with two connecting rods on each pin. The bore is 4⅝ in.; stroke 5½ in. The crank shafts are hollow, but all bearings are large and capable of good service. No fly wheels are used for in each case propellers are expected to serve this purpose. We have built several of these motors but in almost every instance, the buyers prefer that we do not divulge their identity.

We are building at present a triple cylinder motor for Capt. T. S. Baldwin of the airship "Arrow." This is to develop steadily 10 hp. but with a maximum of 15 hp.; to be air-cooled; to throttle within reasonable range, and from the weight of the device at present, we believe it will not exceed 75 lbs. It is a very easy matter to make light-weight toys but to produce results with large bearings and without high speed, is more difficult.

DRESSMAKING AT SEA

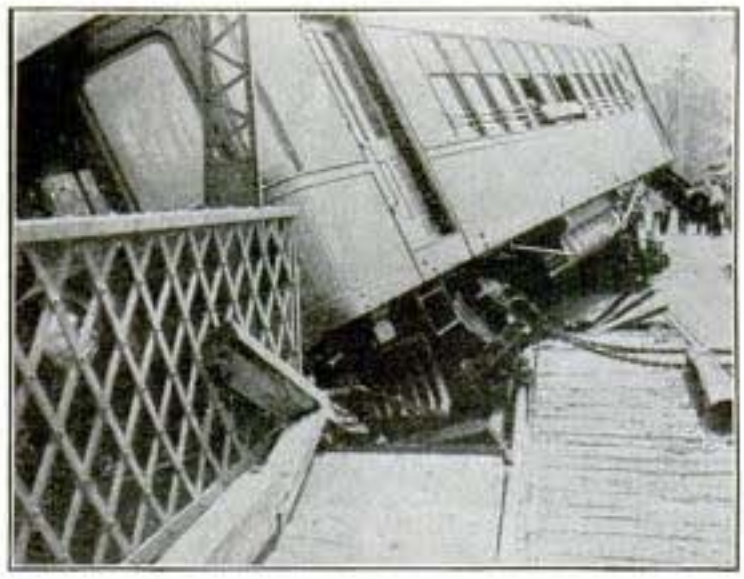
Dressmaking establishments on all big ocean liners is a novel innovation suggested by the editor of the American Shipbuilder, who believes it would be most popular. The gowns designed and made in this establishment could bear the stamp, "Made at Sea," and so avoid the Custom House duty that is paid on goods stamped "Made in France," or "Made in Germany," though the designer might be Parisian. Dresses could be altered or refitted at sea, also, as in the case of an ill-fitting gown, delivered too late to be changed before departure.

PAPER FROM PEAT

In Scotland there are two firms—the survivors of a large number—manufacturing paper—chiefly wrapping paper—from peat, reports United States Consul Fleming of Edinburgh, Scotland. The industry is still in the experimental stage, promising no important results, it is said. The drawbacks to the economical use of the peat are the expense of ridding it of dirt, a large amount of soda in the boiling vats being necessary; lack of fiber, which must be supplied by adding other material than the peat; and the impossibility of bleaching the peat paper, only brown paper being produced. The paper will not harbor moths, however, and this fact may bring it into use for certain purposes.

CAR IN ACCIDENT BALANCED 100 FEET ABOVE RIVER

A remarkable accident on an electric railway occurred in Cleveland, Ohio, recently. A car, derailed on the viaduct over Rocky river, crashed through the railing and tilting to an angle of 60 degrees, balanced and hung suspended 100 feet above the river. The car was so evenly balanced that it was



Remarkable Trolley Accident

feared that the weight of one man, if allowed to enter to remove baggage, would send it toppling down to the stream.

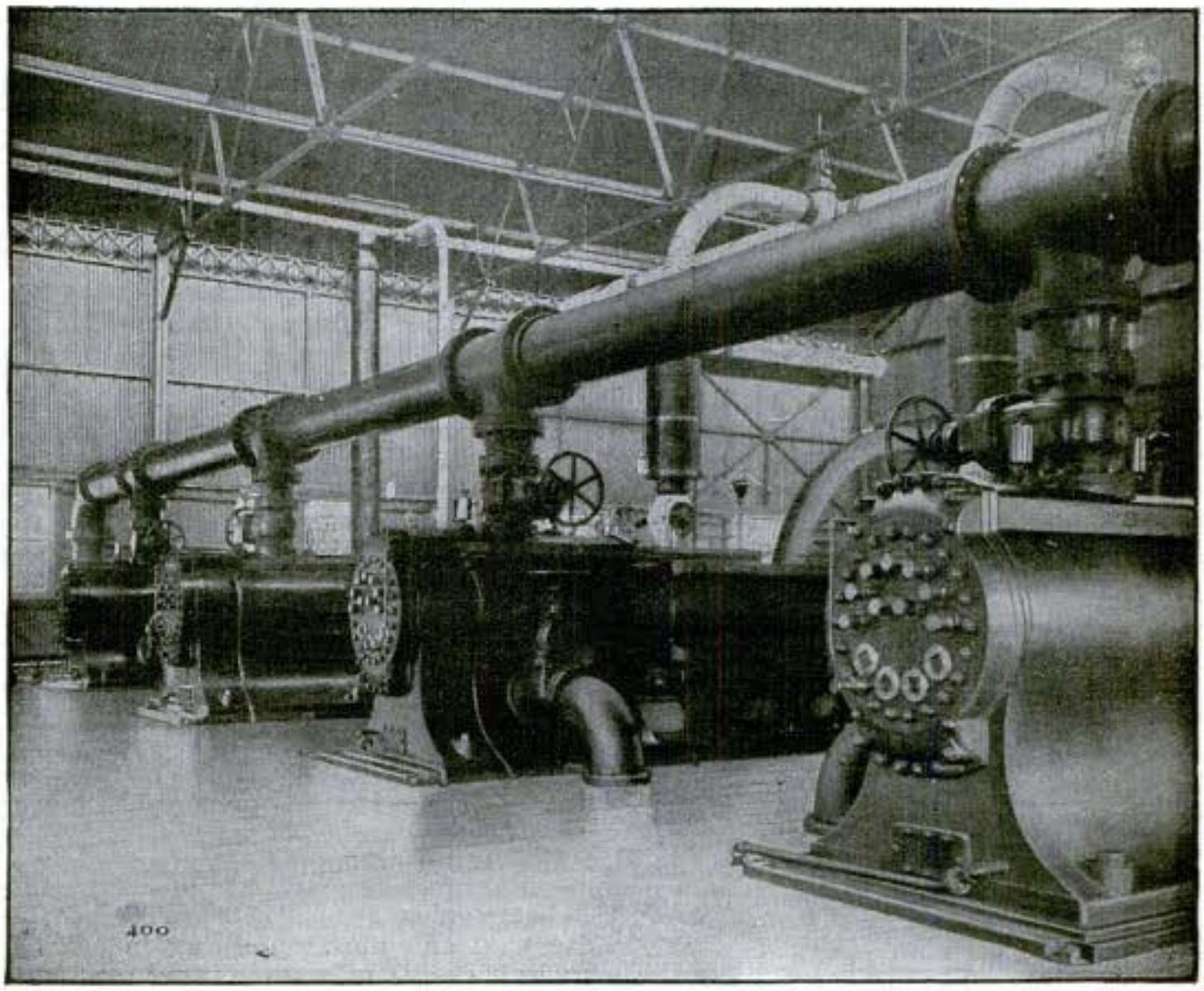
USES 65,000,000 CUBIC FEET OF GAS PER DAY

Gas Compressors Have Capacity for an Artificial Delivery of 100,000 Cubic Feet of Gas per 24 Hours

In conveying gas from wells to consumers, nearly all the energy, or pressure, in the gas is absorbed by friction and the heat value of the gas is all that is obtained, says Air Power. The pressure naturally becomes lower and lower as the well's supply and the volume in the pipe line diminish. For instance, one well drilled to a depth of 3,500 ft. and producing 30,000,000 cu. ft. of gas per 24 hours had a rock pressure of 800 lb., and rock pressures of 1,100 lb. are not at all unusual, but by the time the gas has been delivered through hundreds of miles of pipes increasing in size from 6 in. in diameter at the well to 20 in. in diameter at the point of delivery the pressure will have been reduced to about one lb.

The United States Steel Corporation, which pipes from its own wells in West Virginia and Pennsylvania and consumes as much as 65,000,000 cu. ft. of natural gas per day, raises the pressure of the gas so delivered by means of gas compressors. This installation comprises eight compressors located in three stations and of capacity for an artificial delivery of 100,000,000 cu. ft. of natural gas per 24 hours.

One plant, at Hundred, W. Va., comprises two compressors, six boilers and a reservoir dammed for holding a supply of condensing water. These two compressors have a capacity of 15,000,000 cu. ft. each of free gas per 24 hours. The total weight of each compressor is 450,000 lb. The gas from the two compressors is discharged into four pipe lines at a pressure of 30 lb. per square inch, developing a total of 3,000 h. p. in both machines.



Courtesy Hand Drill Co.

Gas Cylinders of Compressors, at Hundred, W. Va.

AMERICAN SCHOONER "ATLANTIC" WINS 3,000-MILE OCEAN RACE.

On May 16 eleven yachts, representing three of the most powerful and progressive nations of the world, Germany, England and America, started from Sandy Hook, New York, in the 3,000-mile race across the Atlantic ocean for Kaiser Wilhelm's $5,000

The Winner "Atlantic."

cup. On May 30, at 4:40 a. m., just 12 days and 9 hours later, the American yacht "Atlantic" crossed the finish line at The Lizard, England, and was proclaimed the winner. Twenty-two hours later the German yacht "Hamburg" came in, and 23 hours after the "Hamburg" came England's pride, the big "Valhalla."

Enthusiasm, but not surprise, marked the finish of the "Atlantic," for though the Germans' hopes of the "Hamburg" were high, it was generally conceded that the American "Atlantic" was a worthy competitor.

The "Atlantic" is the property of Wilson Marshall and was under command of Captain Charles Barr, who has piloted many of the American cup defenders to victory. The yacht is 135 ft. long, 20 ft. beam, draft 16.5 ft., spreads 20,000 ft. of canvas, and weighs 206 tons. The British "Valhalla" was the largest yacht entered, being 239 ft. between perpendiculars and having a net tonnage of 647.

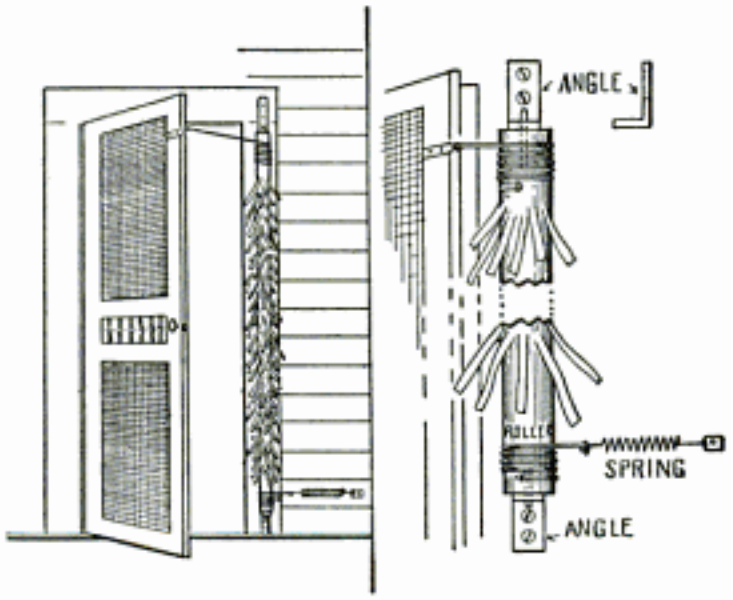
The record was previously held by the American boat "Endymion," which crossed in 1900 in 13 days 20 hours and 36 minutes. The "Endymion" came in fourth in this race.

A new German typewriter is said to print syllables and short words instead of single letters, making it possible to maintain a much greater speed.

TO PREVENT FLIES ON SCREEN DOOR FROM ENTERING.

In the summer the flies that alight on the screen doors and remain there until the door is opened, apparently awaiting a chance to get in, are a great nuisance. The sketch herewith shows a means of frightening the insects away simultaneously with the opening of the door.

To make the device, procure a round pole as long as the door is high, an old curtain pole will do. Make two angles in the pole so it can be fitted with screws to the casing, just as a window shade is fitted on. Tear up a lot of rags into strips ¾ in. wide and 8 in. long. Colored rags will not be so noticeable as white. Tack these rags by one end all around the roller and for its full length, leaving just enough space at the top and bottom to attach a heavy cord for rotating the roller when opening the door. Wrap the top cord around the roller several times, so that when the door is opened it will unwind, rotate the roller and cause the rags to flutter and so frighten the flies. Wind the



To Frighten Away Flies.

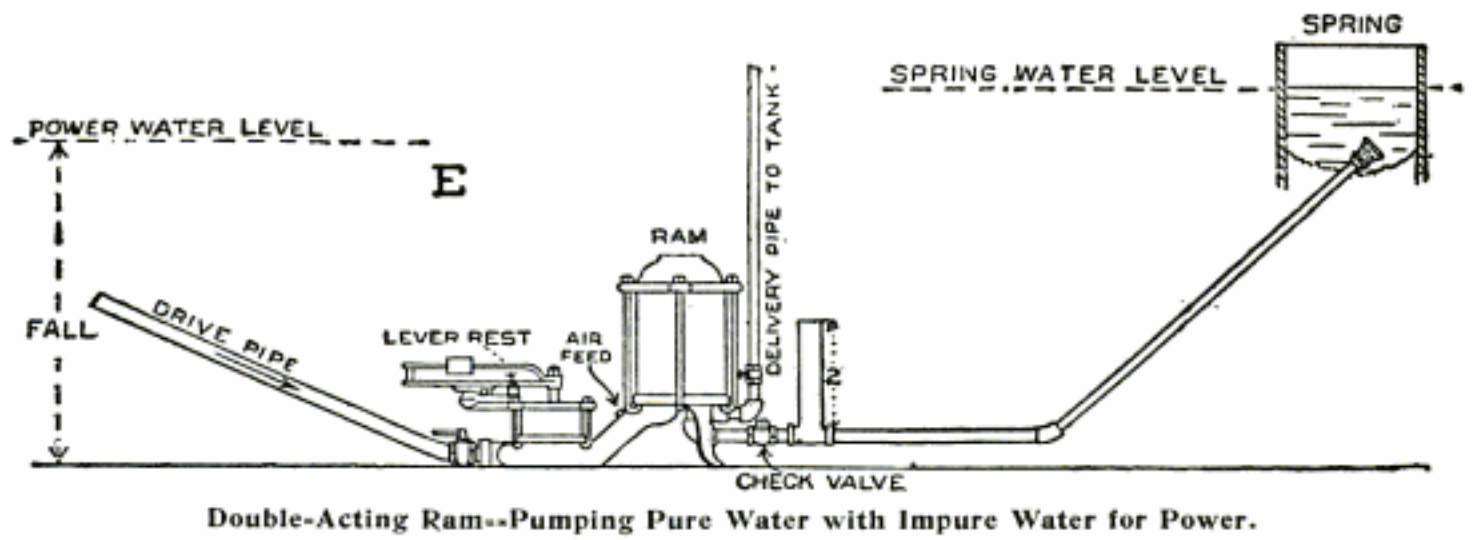
bottom cord in the opposite direction to the top cord and attach a spring to pull the roller back and rewind the upper cord when the door closes.—Contributed by Thiede.

The Michigan Central R. R. tunnel under the Detroit river will consist of two parallel single-track bores with a space of 30 or 35 ft. between them. The tunnel will pass almost straight across under the river, but will curve at each entrance and extend along the shore to meet the tracks there in their present location. The length will be two miles, and the cost $7,500,000. Electric locomotives will be used for hauling trains.

HOW A HYDRAULIC RAM WORKS.

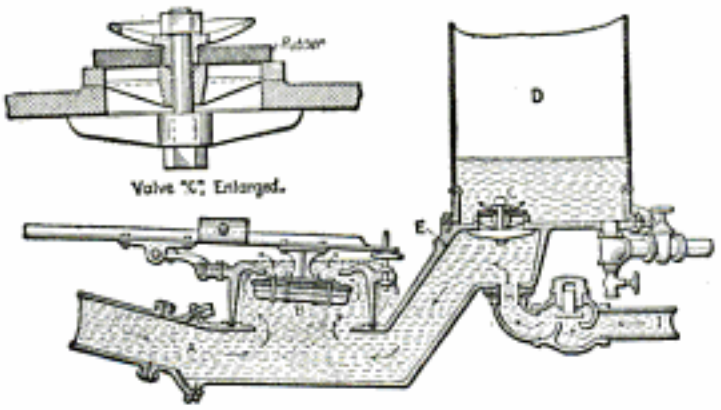
(Published in response to numerous requests.)

The invention of the hydraulic ram is credited to Michael de Montgolfier in 1796. The inevitable improvements since then include greater efficiency and the ability to pump a different water than that which furnishes the power; that is, impure and unusable water may be made to pump good water. Rams are now made to operate with a fall as small as 18 in., and up to 50 ft. Under certain conditions water can be raised 30 ft. for each foot of fall used. A first-class ram requires little attention and ought to run an entire season without repairs. They will not, of course, work when exposed to freezing conditions, but pipes can be buried and the ram housed to operate continuously.



Double-Acting Ram--Pumping Pure Water with Impure Water for Power.

The cut shows a view of the so-called double-acting ram, one which pumps pure water by using impure water for power. Considering it first without regard to the double-supply feature, suppose the opening at H to be closed. The valve at B being open, the water from the source of supply at more or less elevation above the machine flows down the drive-pipe A and escapes through the opening at B until the pressure due to the increasing velocity of the water is sufficient to close the valve B. At the moment when the flow through this valve ceases, the inertia of the moving column of water produces the so-called ramming stroke, which opens the valve at C, and compresses the air in the air chamber D until the pressure of the air plus the pressure due to the head of the water in the main, is sufficient to overcome the inertia of the moving column of water in the drive-pipe. This motion may be likened to the oscillations in a U-tube. At this instant the column of water in the drive-pipe has come to a rest, and the air pressure being greater than the static head alone, the direction of motion of the moving column is reversed and the valve C closed. The water in the drive-pipe is then moving backward, and with the closing of C a tendency to a vacuum is produced at the base of the drive-pipe; this negative pressure causes the valve B to open again, completing the circle of operations. At the moment of negative pressure the little shifting valve E, admits a small quantity of air, and the following stroke this passes into the air chamber, which would otherwise gradually fill with water, the air being taken up by water.



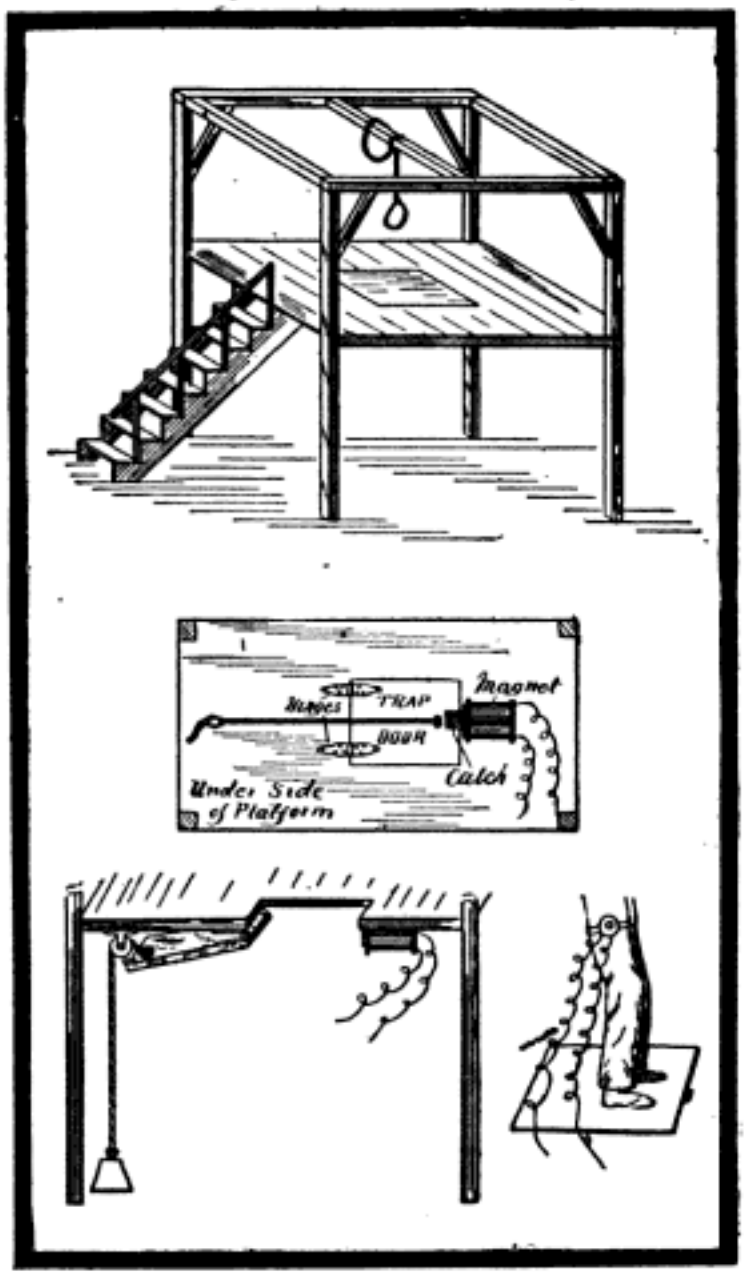
Details of the Ram.

The Mediterranean motor boat race from Algiers to Toulon ended disastrously. Seven craft were entered and were convoyed by a whole fleet of cruisers and destroyers. Every motor boat but one sank and the one spared was carried aboard its convoyer to Toulon, which place was decorated with triumphal arches to receive the winner. The affair turned out rather ridiculously considering that the English government lent its aid at a cost of $140,000.

WILL EXECUTE HIMSELF

By an Ingenious Electrical Device of His Own Design

By the time this reaches our readers, Frank Barker, now under sentence of death in the penitentiary at Lincoln, Neb., will have performed his own execution. The idea originated with Barker, who is



Details of Self-Executing Device

something of an electrician, and was readily accepted by the warden. It is quite likely the same plan will be adopted elsewhere, whenever the condemned has the nerve to do his part; for it requires a strong will to mount the scaffold and at the proper instant with one's own hand press the button which means the end of earthly existence.

Frank Barker was convicted of the murder of his own brother and his brother's wife. His conviction in the lower court was confirmed by the State Supreme court and nothing but intervention by the governor can stay the inexorable hand of the law. As this clemency is unexpected, the condemned man resigned himself to his fate. A few days later he sent for the warden and made a startling proposition. It was nothing less than an offer to execute himself. As the state law says the execution shall be under the supervision of the warden, but does not state who shall perform the fatal act, there was no reason why the proposition should not be considered. When asked how he intended to do it, Barker produced a sketch from which the accompanying illustrations are made.

"You are to attach an ordinary electric push button to my thigh, and when you give the word I will touch the button myself and so release the trap," said Barker.

The apparatus is not at all complicated. From the push button fastened to one leg, where it can be operated by one hand, the arms of course being pinioned, two insulated wires extend through the floor of the scaffold, and lead to a strong magnet fastened beneath the stationary floor. This magnet works a small catch which supports one end of the trap on which the man stands. When all is ready and the button is pushed the circuit is closed, the magnet pulls back the catch, and the trap door flies down and swings up under the floor by means of a heavy weight which holds it out of the way.

The idea has often been suggested that some mechanism be adopted by means of which the condemned would become his own executioner. Such a departure would be most welcome to sheriffs and wardens generally, and while it is hardly to be expected that the method described can be applied in many cases, it would seem that some other equally effective system could be devised, whereby the victim unconsciously, but certainly accomplishes his own tragic end.

The manufacturing center of hand and sewing machine needles for continental Europe is Aix la Chapelle, Germany. All the needles are made by hand labor. China uses more needles for hand-sewing than any other country.

SMALLEST PRACTICAL AUTOMOBILE EVER BUILT.

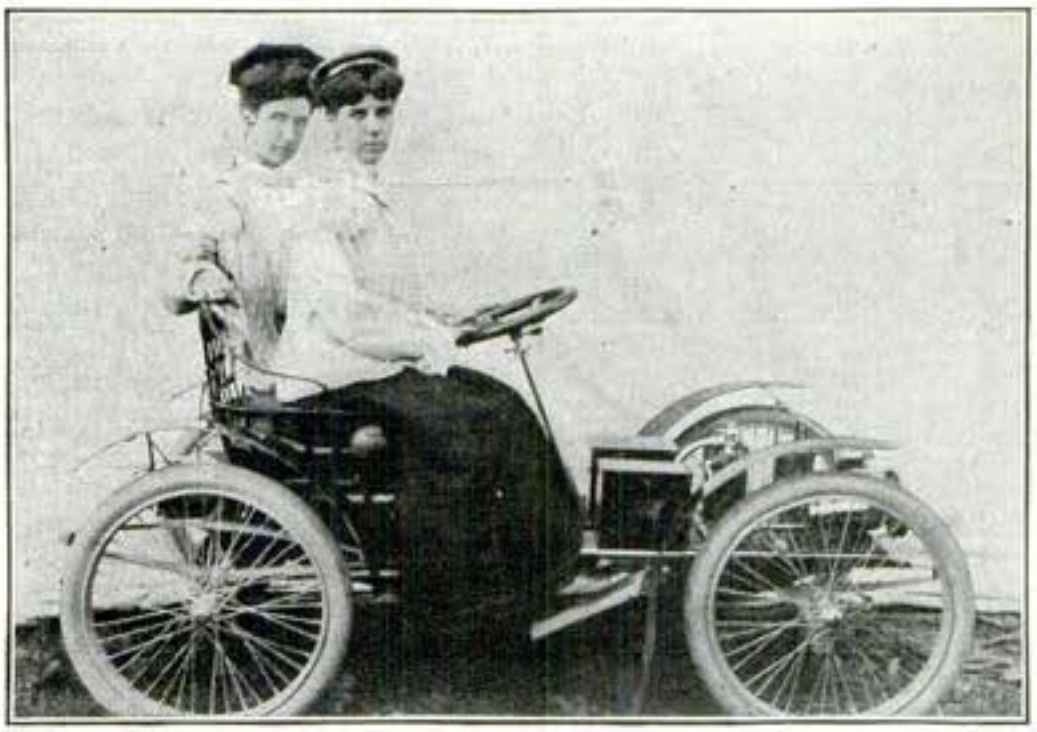
Little Machine Weighs only 356 Pounds.--Makes a Speed of 27 Miles on Good Roads.

A little automobile which weighs no more than 365 lb., daily spins over the fine roads at San Jose, Cal., carrying its owner to and from his business. The machine is the property of Chas. V. Randall of that city, a thorough believer in the light auto for city business errands, he declares, and was built by himself.

The illustration shows the auto with two girls seated in it, though it is built to carry but one person.

In building the auto, Mr. Randall says he used the wheels, axles and motor of a quadricycle and fitted up the other parts according to his own design. Further description of the various parts is as follows: Tread, 36 in., wheel base 54 in., tires 26 in. x 2½ in., motor 2¼ hp.; transmission chain through planetary (two speed) change speed gear, 8 to 1 on high, 18 to 1 on low, no reverse—ample speed and hill-climbing power for all practical purposes. The machine is geared normally at 18 miles an hour, but has made 27 miles per hour on the San Jose-Oakland road.

The seat of the vehicle is 26 in. from the ground, and the footboards on the side make a very comfortable rest for the feet, as well as giving added stability when riding over rough roads. The gasoline capacity of the machine is 3¼ gals., sufficient for running 195 miles, or a 60-mile run for every gallon of gasoline used.



The Lightest Automobile in Practical Use.

DID THE CALIFORNIA RAINMAKER MAKE GOOD?

The prosperity of thousands of California fruit growers depends upon the amount of rainfall during the winter months. The more rain, the bigger crops; a shortage of rain means a short crop or none at all. Hence it was the great fruit interests in and around Los Angeles took such a lively interest when a man named Hatfield appeared last fall with a sure cure for drouth.

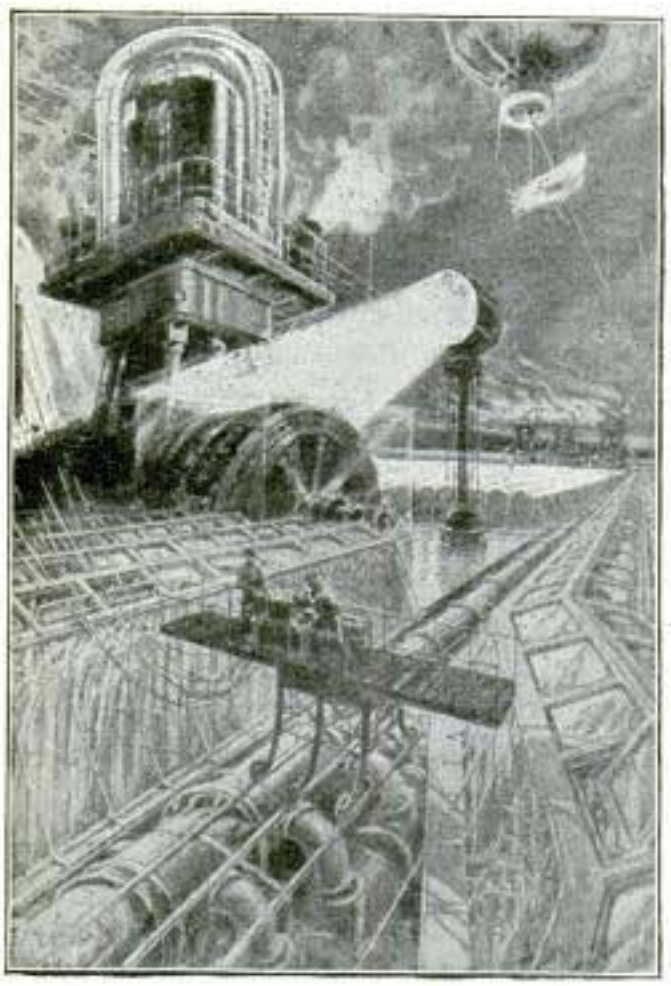
His proposition was to produce eighteen inches of rainfall within a designated period, and receive the sum of $1,000 for his work.

The official records show a fall of a fraction of an inch in excess of the required amount. The price has been paid but the purchasers are very much in the dark as to whether the rain man really did anything or not.

On a high hill, far remote from all other buildings, stands Hatfield's tower. The few who have been permitted to look through the door report mysterious retorts, wires, and bottles of chemicals. But this is the extent of what anybody knows of the process. The inventor answers all questions with a quiet smile and furthermore the rainmaker sayeth not. The merchants are still guessing and asking each other "Did the rainmaker make good?

ELECTRIC FARM OF THE FUTURE.

It is not impossible that the time when the farmer shall conduct the whole of his operations by machinery and the application of scientific principles will precede the millennium. A time when there will be no drouth, nor ruinous floods of rain; when



1930 A. D.?

the crops shall not fail, but will be forced to perfect maturity in less time than required by the natural process.

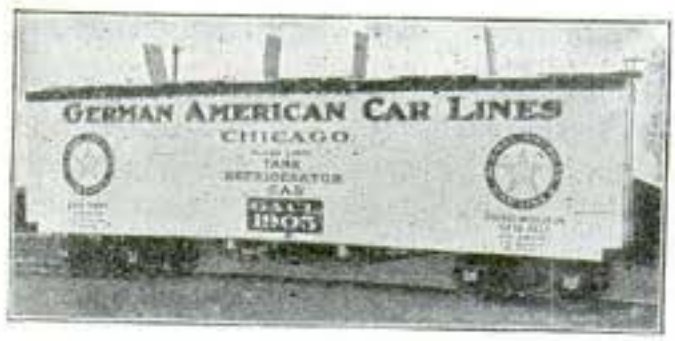
Our illustration depicts something of how this would be brought about. A huge forcing house run entirely by electricity, which when all the streams and falls are harnessed may be as cheap as water, is the method employed. Old Sol still sheds his luminous rays which are utilized to their full efficiency by glass enclosures, but he is assisted by powerful electric lights and vast systems of radiators. Unless the California rainmaker has a better system, storms will be produced by firing mortars and shells and dissipated by the same means, on occasion. The whole system will be under the control of one or two operators and the farmer can tilt back in his chair, elevate his feet and smoke and watch the grain grow. We predict that an American farmer will be the first to have a plant of this kind.

IRON LIGHTNING CONDUCTORS.

Sir Oliver Lodge is reported to have expressed his opinion in favor of iron lightning conductors in preference to copper ones. The former allow the current to flow more gradually and to leak more slowly, while with copper, especially if it be of large diameter, a more sudden effect is produced, which may cause side flashes and do damage. The iron rod may be fused, but only after it has done its work, and it is easily renewed, says Knowledge and Scientific News, London. A lightning conductor should be looked upon as a safety fuse, to be replaced when it has been struck.

GLASS LINED FREIGHT CARS.

A new and radical departure in freight cars is the new glass lined tank cars which were exhibited for the first time at the International Railway Congress at Washington. The exterior resembles a refrigerator car, but no provision is made for icing. The Railway Review says: The only entrance to the car is by trap doors in the roof. Within are placed four large glass-lined steel tanks, each of which has a capacity of 1,952 gallons. These tanks are 90 ins. in diameter and have conical bottoms and tops and are set into the floor a short distance for stability. The tops of the tank reach within a short distance of the roof and have a manhole in the center. Over these manholes there are trap doors, which are shown open in the illustration through which the tanks are filled. In the bottom of the tank there is a pipe connection, admission to which is obtained through an



A Glass Lined Car.

opening in the floor of the car, which is covered by a trap door, for the discharge of the contents.

This car is designed for the transportation of olive oil, acids, and, in fact, anything which is usually transported in bottles. It is readily seen that that the different tanks can be filled with different liquids.

POP LIFE SUBSCRIPTIONS $10

And How the Publishers Can Afford to Do It.

Popular Mechanics during the balance of your life for $10.

That was the offer we made last month.

The offer is still open.

How can we do it

It's no secret, and our readers are entitled to know.

First, money is worth 6 per cent a year to any publisher. He can use it so as to earn even more than that. But at 6 per cent, the $10 yields 60 cents a year indefinitely. Hence on our life subscribers we receive 60 cents or (more) every year, from their investment.

Second, it costs nearly 10 cents a year to send a subscriber notice of his expiration, receipt for his remittance, make the several entries on our books, hunt out his name in the mailing list and change the expiration date there, and also correct and classify in its proper place, the name in our office reference list. All this costs in postage, printing and labor about 10 cents.

Adding the 60 cents which the $10 investment pays yearly, to the 10 cents which is saved each year, we have the equivalent of 70 cents a year during the life of the subscriber. A life subscriber may fairly be classed with wholesale sales, and we can afford, and almost every other publication can afford, to wholesale a dollar magazine at seventy cents.

So you see there is nothing so very philantrophic about us after all when we offer a paid-up subscription for life to Popular Mechanics on a cash payment of $10. Moreover we earnestly hope none of our life subscriptions will expire before the subscriber has attained the century mark, at least.

Pop. the balance of your life $10.

NEW RACING MONOCYCLE.

In this new racing machine the rider sits in a chair, which is held by a frame which is held in position by grooved wheels running upon a single rail track on the inner rim of the large pneumatic tire. The main wheel is 9 ft. high with a flat face of thin steel 5 in. wide; this to enable its operation over sand and soft roads. It is claimed a speed of 60 miles an hour is possible and that the machine will climb over stones and other obstructions.

MOTORCYCLES FOR POLICEMEN.

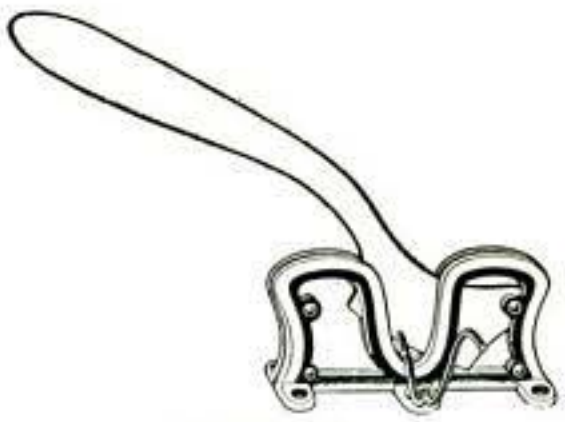
Motorcycles are being used for many practical purposes in Europe. In Paris and some other large cities motorcycles have been added to the equipment of the police department. When a call comes in from some distance requiring only one or two

A "Motor Cop."

men, they are dispatched on the motorcycles which are capable of high speed on the excellent streets and roads in that country. The illustration is by courtesy of the Motor Age.

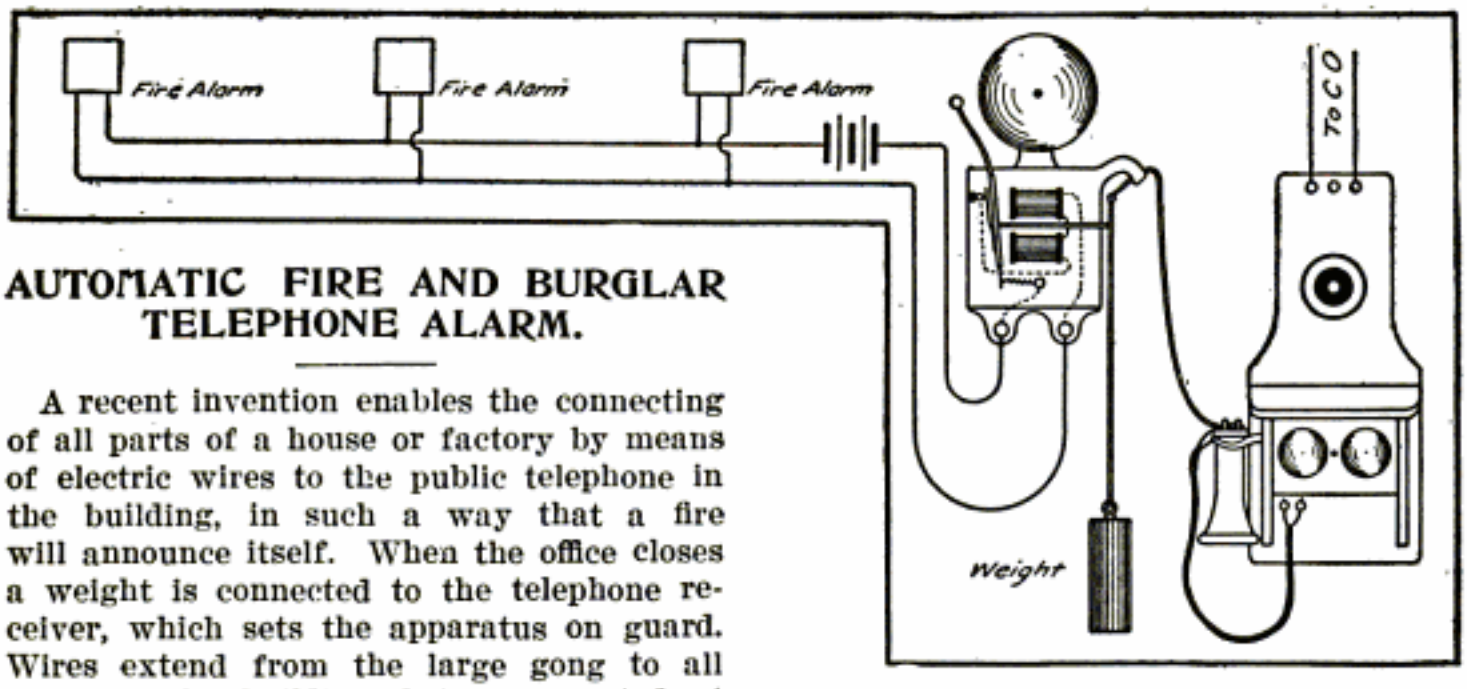
A CHICKEN GUILLOTINE.

The time-honored axe is to be relieved of its historic occupation, and no longer can the comic artist use it with his annual turkey jokes in November. The fowl is to still



The Beheader.

be separated from its head but in a genteel, humane manner. The chicken guillotine, or poultry beheader, is the name of this new mechanical instrument which is guaranteed to do quicker and better work.



AUTOMATIC FIRE AND BURGLAR TELEPHONE ALARM.

A recent invention enables the connecting of all parts of a house or factory by means of electric wires to the public telephone in the building, in such a way that a fire will announce itself. When the office closes a weight is connected to the telephone receiver, which sets the apparatus on guard. Wires extend from the large gong to all parts of the building, being connected at frequent intervals to thermostats. When a fire starts in any room the ceiling becomes hot, the mercury in the thermostat rises, thus closing the circuit, causing the gong to sound and lifting the receiver from its fork. This calls "central," who hears the gong striking and reports the fact to the fire department. By attaching ordinary electric burglar alarms to doors and windows a burglar alarm service is secured. If a burglar alarm system is already installed connection can easily be made in a few minutes by any electrician. It is suggested as an excellent means of safeguarding a house while the occupants are absent for the summer. Our illustration is by courtesy of the American Telephone Journal.

PERFORATED NIGHT SIGNS.

The latest destination signs which are carried on street cars are now made of perforated sheet metal, says the Street Railway

Perforated Sheet Metal Signs

Journal. One electric light is placed behind the sign which is a great improvement over the glass painted signs which are easily broken and when dirty are indistinct. The light shines brightly through the holes spelling out the letters which can be seen a long distance. Merchants can easily employ the same means for special announcements in night advertisements and any mechanic can readily fill an order for perforated signs on short notice and at trifling expense. The sign should serve as the front of a box inclosing the light which can be connected to any convenient socket with a flexible wire cord.

COMPRESSED AIR AT ALTITUDES.

With increase in altitude the barometric or atmospheric pressure falls from 14.7 pounds per square inch at sea-level to about 10 pounds at 10,000 feet above sea-level. Since the density of the air decreases with its pressure it is obvious that at such an altitude the total weight of air handled by a given displacement is considerably less than at sea-level; and that to fill any volume—a rock-drill cylinder, for instance—with air compressed to 90 pounds, a greater free-air displacement will be necessary than would be required at sea-level. The relative capacities of a given displacement to do work—as in rock drills or pumps—at varying altitudes are indicated in the following table:

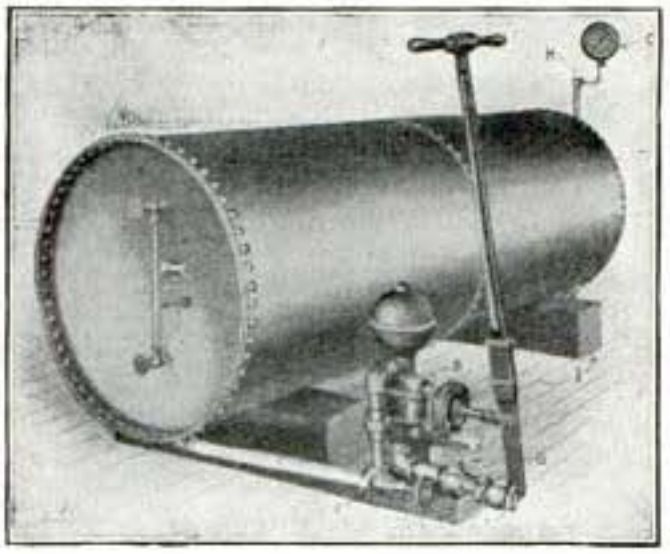
Feet above Sea-Level	Barometer Inches	Relative Capacities	Feet above Sea-Level	Barometer Inches	Relative Capacities
0	30	1.000	4500	25.26	.867
500	29.42	.983	5000	24.78	.856
1000	28.87	.967	6000	23.85	.827
1500	28.33	.954	7000	22.95	.800
2000	27.79	.938	8000	22.10	.772
2500	27.27	.924	9000	21.22	.750
3000	26.76	.909	10000	20.43	.725
3500	26.25	.894	12000	18.93	.677
4000	25.75	.879			

Twelve glass-head pin factories at Aix la Chapelle, Germany, average an annual output of 1,500,000,000 pins.

PNEUMATIC WATER WORKS.

Inexpensive Compressed Air System Provides All Advantages of City Water Works to Any Builder

Americans use more water than any other nation in the world. From earliest childhood they are taught not only to use water freely, but actually to waste it. Plenty of water has so long been a necessity that no one could be induced to accept any other belief. In the large cities millions of dol-



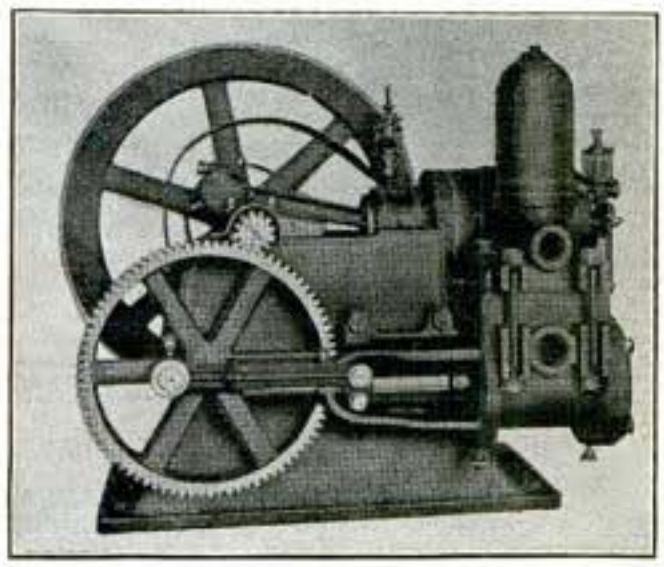
The Hand Pump.

lars have been spent in securing, improving and extending the municipal system of water works. Every day 398,925,628 gallons of water are pumped out of Lake Michigan into the homes of Chicago. Indeed there are few towns of 1,500 inhabitants without their water works.

A good water supply in a house is quite as essential to comfort and health as that of heat, and vastly more so than the question of artificial light. As people have gone out from the cities into the country they have installed various private systems of water supply, using gasoline or hot air engines, rams, and windmills to do the pumping. The latest method is the pneumatic, which in first cost, is so low, and in operation so simple as to make a description of it interesting. And this system may be briefly explained as a strong steel tank filled partly with water and partly with compressed air. A pump to get the water into the tank and the usual service pipes to conduct the water where it is wanted complete the story.

To go into more detail it should first be stated that the success of the system depends more on the tank itself than all else. A tank which will hold water alone, at say 200 lbs. pressure, may leak air at 70 lbs., for the same reason that a basket which will hold a bushel of potatoes will leak sand, or a watch case which is waterproof will become filled with dust in time. Air is thinner than water and will pass through a smaller opening. By the pneumatic system a pressure of 40 lbs.—which is more than is found in most city systems—will elevate water through pipes to a height of 93 ft. or throw a stream into the air to 55 ft.; 70 lbs. pressure elevates in pipes to 160 ft., and throws a stream to 75 ft.

The tank can be placed in a basement, or shed and need not be directly over the cistern or well from which the supply is taken. no elevated reservoir is required; the tank should be of a size proportionate to the quantity used. Attached to the tank, preferably, but located elsewhere if necessary, is a special pump for forcing the water into the tank. For residences and similar requirements two to four pumpings a month are sufficient for all household purposes. The compression of the air in the tank is secured by pumping the water into the tank, not by allowing the tank to partly fill with water by gravity and then pumping in air. The pumping may be done by hand for the smaller systems, or by windmill, gas en-



Gasoline Motor Air Compressor.

gine, electric motor or hydraulic rams. and the tanks have been built from 200 gals. capacity for a house up to 5,000 gals. for ranches. For systems using a large amount of water, as for instance a large apartment

Stream of Water 100 Ft. High Thrown by Compressed Air at Capital Building, Lincoln, Nebr.

building in Louisville, Ky., which uses as high as 6,000 gals an hour, the pumping obviously must be done by power. Where windmills or electric motors are used a self-acting regulator starts and stops the pump without any attention. For a medium size residence 5 to 10 minutes per day pumping by hand will suffice and is not specially hard work.

WRECKED A TRAIN TO TEST STEEL CARS.

At Pittsburg, Pa., recently, a train of 50 new steel cars was divided into three sections, two of which were left standing 50 yds. apart on the track, while the other section was drawn away by an engine for a distance of two miles and then run back at a 40-mile rate until the rear of the moving section crashed into the standing cars.

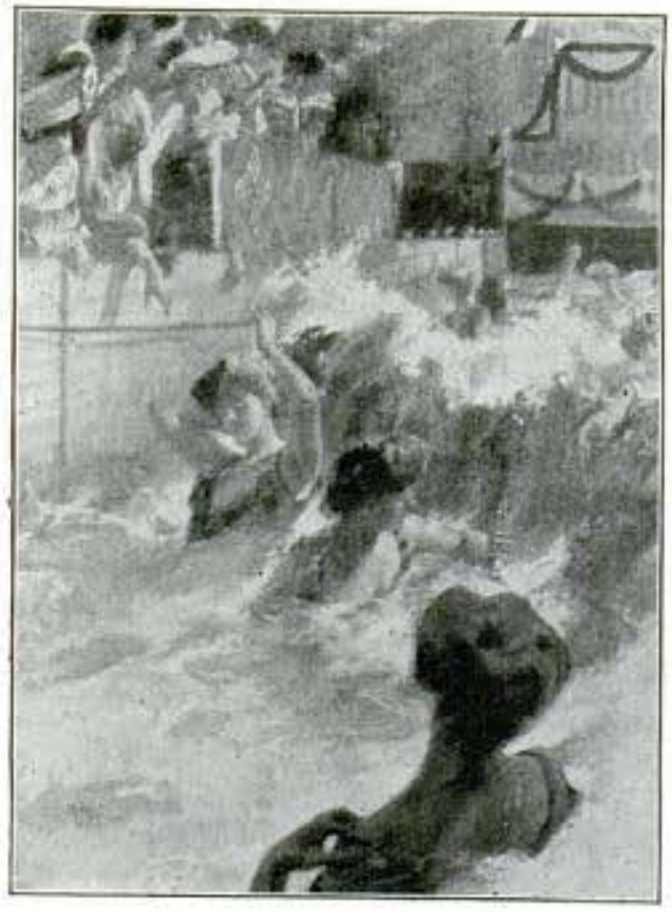
No damage was done, as it was merely the means devised by George Westinghouse to show 300 delegates to a railway congress how the friction draft gear, with which the cars and engine were equipped, would prevent wrecks of the kind. When the crash came, there was a quiver throughout the line of cars, then they settled down on the track, all three sections coupling together automatically.

TOURISTS' AUTOS IN CANADA

Tourists taking automobiles into Canada are now required to deposit $25 and a bond for twice the amount of the estimated duties with the customs' officials. Formerly a deposit of 35 per cent of the value of the machine was exacted. The tourist is given a receipt and a permit which is good for three months. When the permit with proof of the exportation of the machine is returned to the collector the deposit is refunded. Where collectors are satisfied that the machine is to be used only in the locality at which it is brought in the deposit may be waived. The tourist cars may not be used in Canada for gain or hire.

"THE BREAKING WAVES DASHED HIGH" IN A SWIMMING TANK IN GERMANY

This is fast becoming an artificial age. In Munich, Germany, hundreds of miles from the ocean, sea water is counterfeited by the use of sea salt, and an electrical machine



Artificial Waves.

beats the water at intervals, causing a big surf to roll along the bath. The intensity of the waves can be regulated by turning the switch controlling the electric machine.

TUNNELING UNDER PARIS.

Electric Railway Passes Under the Seine---Elevators Are Required at Stations.

[Translated for Popular Mechanics from La Nature.]

The line No. 4 of the Metropolitan Railway, having a north and south trend, passes under the Seine between the Pont Neuf and Pont des Arts, and serves the important purpose of extending the Rue de Rennes from the place St.-Germaine-des-Pies to the quay of Conti.

The original route made use of the Rue de Louvre, which it follows at right angles to the Seine, coming out beneath the Institute at the Place St.-Germaine-des-Pies.

As this project met with opposition from the Institute two modifications of the route were proposed: (1) by the Rue Dante; (2) by the Rue Danton. After a long discussion the Municipal Council decided in favor of the route by way of the Rue Danton.

The line No, 4 begins at the Rue Halles, crosses beneath the passenger line from the Vincennes Gate to the Maillot Gate (line No. 1) traverses diagonally the Place du Chatelet, then passes below the main branch of the Seine above the Pont au Change, continuing beneath the flower market, crosses under the lesser branch of the Seine above the Bridge St. Michel, passes under the Orleans Railroad, finding its way beneath the Boul. St.-Andre-des-Arts and the Rue Danton, which it follows to Boul. St.-Germaine. All the curves are more than 492 ft. radius.

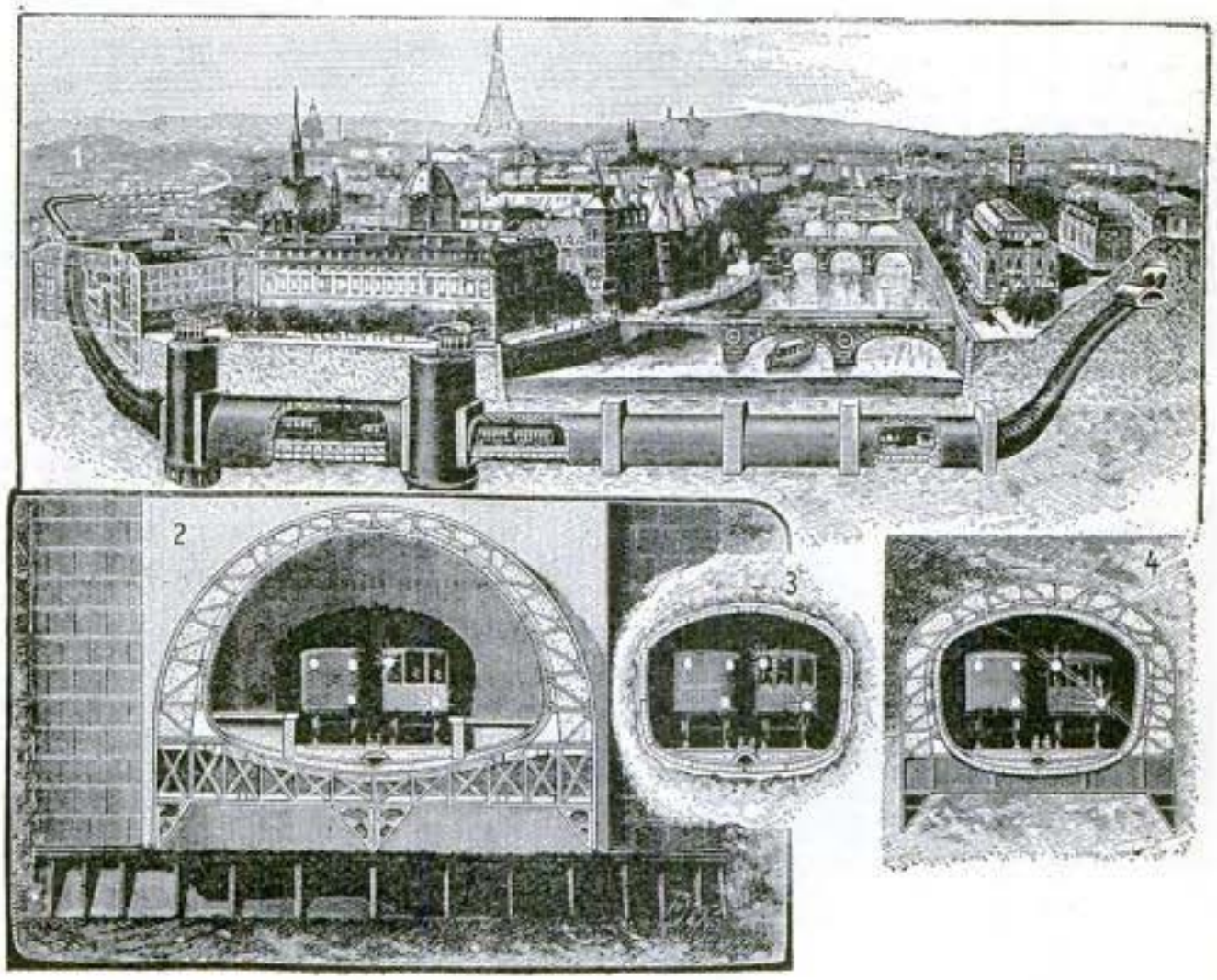


Fig. 1. Showing Various Tunnel Sections.

It will be noticed that this deviation, although considerably increasing the length of the route, is the only plan by which damage to the foundations of the Palace of Justice and the abutments and piles of the bridges Change and St. Michel could be avoided.

At the beginning the incline is 1½ in. per 3.28 ft., which soon becomes 7/25 in., continuing at this rate until it reaches the Seine, which it traverses 36½ ft. beneath the level of the water. After passing the small branch of the river, the rate of incline

is 6/25 in. per 3.28 ft.; then there are two inclines of 1½ in. per 3.28 ft. separated by an intermediate level at a depth of 52½ ft. beneath the street.

The chief works of construction are (1) the tunnels under the railroad tracks; (2) the stations; (3) the work of joining the tunnels and the stations.

The first plan was to cross the Seine by means of twin tubes, each having a single track, which was thought preferable on account of its economy. However, the plan presented by M. Chagnaud, the well-known engineer, was agreed upon. His plan employs a single tunnel with a double track and has the advantage of both facilitating transportation and being economical.

The walls are formed by a metal casing covered inside with concrete, over which is a layer of Portland cement. The width is

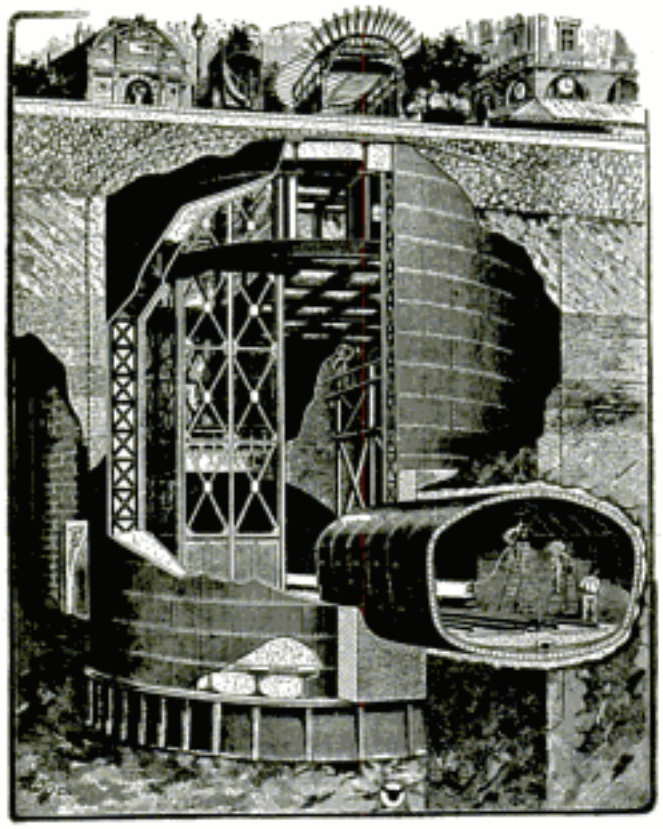


Fig. 2. Elevator to Street.

24¼ ft. and the height 17¾ ft. The lining is formed of a series of cast rings, 2 ft. long, curved to correspond to the arch of the tunnel and riveted together. Each ring is composed of 13 curved plates, a small one forming a key to the arch. The curved plates, 1½ in. thick and weighing 992 lb., are strengthened by ribs 4¾ in. high which extend inwardly. To fill the space and support the casing, cement is inserted through holes left in the casing, by means of the Greathead machine, which rams the cement with a pressure of 22 lb. per sq. inch.

In constructing the subway shields were used, except beneath the Seine where caissons were sunk. Under the main branch (Fig. 2, No. 3) the tunnel conforms to the description above, but under the lesser branch a metal framework is used having a spherical covering above and a shield below, leaving a space of 5.9 ft. in height, in which the laborers perform their perilous work. The interval occupied, by a great number of cross bars and columns affords strength and is completely filled with concrete. The caissons, hermetically sealed at their extremities by means of metal panels, are put in communication with each other by an interesting procedure, proposed by M. Chagnaud. Three caissons with a curve of 1,148 ft. radius are used in passing the main branch (Fig. 1, No. 1), two straight caissons being employed beneath the lesser branch. The cost of the subway per lineal ft. is estimated at about $300.

The stations are each constructed of a single metal caisson, similar to the subway caissons but much larger (Fig. 1, No. 2). The covering is formed of thick plates of steel fastened to the framework of the caissons by crossbeams and the space filled with concrete. The section shows a semi-circular arch 40 ft. in width and 27½ ft. high. The interior of the stations is covered with white enamel. Each station has two platforms running the full length, 246 ft., and 11½ ft. wide. This allows a space of 18 ft. for trains. The cost of the station per lineal ft. is about $825.

At each end of the station is an iron well containing elevators, the well at one end being used as an entrance and the other as an exit (Fig. 1, No. 1 and Fig. 2). The wells are covered by metal plates strong enough to bear the traffic of the streets.

The rails are laid on wooden cross-ties, well ballasted. The platforms of the City station are 62¼ ft. below the street level, and those of the St. Michel station are 50 ft. below the street, thus rendering elevators indispensable.

The subway traverses a water-bearing layer of alternating marl and limestone, where it is necessary to use compressed air by a method long employed in England for the tunnels beneath the Thames.

The estimated cost of constructing this 3,526 ft. of subway, which will take not less than 18 to 20 months, is $2,053,327 for the substructure alone; nevertheless, to prepare for contingencies, the Municipal Council has voted $3,763,500.

GREAT THEBES BRIDGE OPENED.

Has No Draw, but Clears Boats at High Water--Construction Occupied Three Years--Lowest Grade Bridge On the Mississippi.

Thebes Bridge, 3,817 Feet Long--Ralph Majeska, Engineer.

The Thebes bridge that has been under construction for three years past and which cost the company $2,800,000 in money and sixteen human lives has been thrown open to the heavy freight traffic it is expected to carry across the Mississippi between the old town of Thebes, Illinois, and a new Missouri terminal that has sprung into existence with the bridge.

The bridge, which is of the cantilever type, with five spans, is a steel double-track structure, and, including the concrete approach on each side, is 3,817 ft. long. The cantilever or channel span is 671 ft. long and the other spans are each 521 ft. long. On the Missouri side the approach comprises six 65-ft. and one 100-ft. concrete arches, and on the Illinois side there are five 65-ft. arches. The spans are 108 ft. high in the clear above low water and 65 ft. above high water. The bridge is built at a grade of one-half of 1 per cent, the lowest grade of any bridge across the river. In its construction 945,000 cu. ft. of concrete was used in the approach spans, and 27,000,000 lb. of steel were required for the superstructure. The weight of the steel structure is about 28,000,000 lb.

COLD, PHOSPHORESCENT LIGHT IDEAL FOR THE FUTURE.

Electrical energy utilized in such manner that it will produce light without converting it into heat is the prediction of Dr. J. A. Fleming, of London, as to what the ideal light of the future will be. An exhausted glass tube will contain a small body which, when acted upon by electrodes placed at suitable points around the body, will cause it to become brilliantly phosphorescent, producing as nearly as possible only luminous rays. The theory is that the luminous rays are produced by vibrations of the corpuscles of atoms, while the heat rays are caused by vibrations of the atoms of matter as a whole, so that if the corpuscles can be caused to vibrate without producing vibration of the whole atom, we will have, practically, cold light.

TUNNEL UNDER NORTHUMBERLAND STRAIT PROPOSED.

Every winter the inhabitants of populous Prince Edward island, separated from Nova Scotia by Northumberland strait, 7½ miles wide, are cut off from communication with the mainland almost entirely for several months. Supplies of all kinds, business, social intercourse—all must wait till the ice breaks up and the blockade resulting is over. The inconvenience is so great that the subject of making a tunnel under the strait for the use of trains is being urged and it is probable that the Dominion government will act upon it and forward the undertaking. Such a tunnel would cost, approximately, $10,000,000, and require six years to construct.

If built it may lead to constructing a tunnel connecting England and France.

MOVED A HOUSE FROM OHIO TO INDIAN TERRITORY.

Old Homestead Taken to Pieces, Packed Up and Shipped, To Be Re-Erected In the Southwest.

A Cleveland, Ohio, physician who in May last, moved to Indian Territory, took his home with him. The building was a 15-room frame structure substantially built, and stood on one of the prettiest streets in Cleveland. The doctor's mother-in-law, who is a member of his family, had lived in the old place for 35 years. And so when the change of location was in prospect, the occupants decided to take the old home along. To move it the building was taken entirely to pieces. Every joist, rafter and board was loosened with great care so that no part might be injured or marred. The lumber as it was removed was carefully marked to assist the men who would re-erect the old home in the new country. Nothing but the foundation, lathes, shingles and

Packing Up the Old Home.

old plaster was left. The boards were neatly stacked, strapped together and the whole of the 15-room house loaded on one freight car. In Indian Territory it will be re-erected, with no change in size or shape. The men who took the building apart said that excellent lumber had been used in it and that the new old house would be better than many new houses constructed nowadays.

UNDER WATER 24 HOURS.

Daniel Hayes, a professional diver who was making repairs in 15 ft. of water at Canton, Mo., was caught and held helpless for 24 hours. He was sucked under a large boulder and held so he could not move to help himself. Another diver came 200 miles and released him just in time, as his suit was leaking badly and would have filled with water in another half hour.

RECEIVED 12,000-VOLT SHOCK AND WENT FISHING NEXT DAY

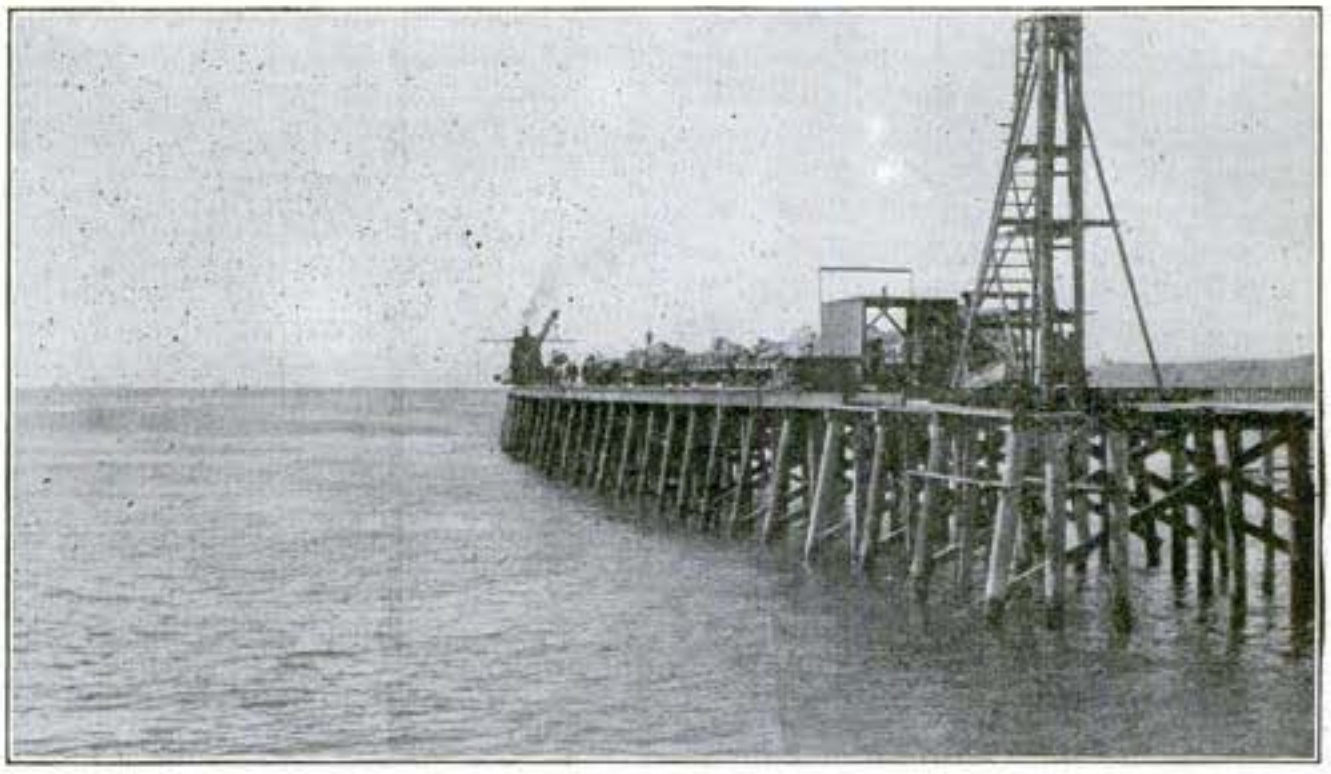
[B. C. Shipman, in Electric Journal.]

A remarkable case of resuscitation was accomplished on a man who received about 12,000 volts. We were running a load test on the transformers of this plant, and the bare high tension wires were led directly from the transformers out of the windows and to plates dipping in the river. The voltage was 25,000 and the arrangement two-phase, all four plates being in the river at the same time. In corroborating the fact that the man received 12,000 volts, experiment developed that practically the whole resistance of this natural water rheostat lay in the contact resistance between the plate and the water, and not in the distance of the path between the plates. A distance of forty feet between plates produced no measurably different load than a distance of twenty feet, with equal amounts of submersion. Hence the whole body of water and earth adjacent was practically at a midway potential between the two wires. The workman, in direct violation of orders, stepped upon a brick and concrete platform immediately over the water where the plates were hung and his head came in contact with one of the wires. In falling he broke from the top of his head an arc about eighteen inches long. His head was burned completely to the bone, as were also his feet, though slightly. By vigorous working he was brought around in three-quarters of an hour, and after dressing went fishing the next day. Without doubt he must have had a cast iron constitution, but it shows what is possible in case of electric shock.

In the running of this test a great number of dead fish floated up to the surface from between the rheostat plates, and the peculiar fact was noted that many of them were distorted, being bent somewhat at right angles in the middle of the body. An explanation of this condition of the fish was sought by the operators, who gathered them in, from the assembled electrical sharps. All passed it up until our erstwhile chief of the transformer division opined that it gave a beautiful illustration of the quarter-phase current, as the fish were killed in a two-phase rheostat.

BUILDING A MIGHTY SEA WALL

California Refuge Harbor for the Fleets of the World==Will Have an Area of 1,200 Acres==Deep Enough for the Largest Vessels



Building the Largest Breakwater in the World.

At San Pedro on the coast of California, Uncle Sam is building a harbor of refuge for the fleets of the world from the storms of the Pacific. The only natural harbors of safety the California coast affords, San Francisco and San Diego bays, are 600 miles apart and vessels are frequently overtaken with few chances of reaching either port. San Pedro is between these two points, though much nearer San Diego, and until recently has only been a port when the weather was good.

The huge breakwater now under construction was begun in 1900 and will be second to none in the world. According to Government plans it begins one mile off Point Firmin and extends far out seaward. It is 64 ft. high, 190 ft. wide at the base and 20 ft. wide at the top. At low tide it stands 14 ft. above sea level.

The wall foundation has been constructed of very large rough rock and the top has a superstructure of smoothed stones laid regularly, but without cement mortar. Rock at first was brought on scows from Santa Catalina islands, 28 miles out at sea. Afterward it was obtained at Chatworth Park, on the mainland and brought down by rail. At this quarry a large force of men are constantly employed blasting, cutting stone, loading the cars, etc. About 2,000 tons of stone are daily shipped, or 70 large cars per month.

Along the line of the sea wall and simultaneously with it a trestle carrying a railroad has crept seaward until it has now reached a point 10,000 ft. out and is still growing. Cars loaded with material are run out over this line and dumped at the point required. A powerful pile-driver is the advance guard of this improvement. Scattered along at intervals are large cranes, which, with their huge iron arms, lift the stones (weighing from eight to twenty tons each), and drop them at the proper places. For the entire distance of the piling, have these ponderous rocks been dumped and during the past year 1,609,369 tons of stone have been placed on the substructure and superstructure of the wall. The two kinds of rock used will give the breakwater strength to withstand the most tremendous waves the old Pacific can hurl against it.

The inner harbor also is being improved. It is being dredged to a depth of 25 ft, and its area greatly increased. The harbor improvements will cost $3,000,000 and will include an area of 1,200 acres.

ELECTRIC LAMP BURNS STEADILY FOR 20,000 HOURS.

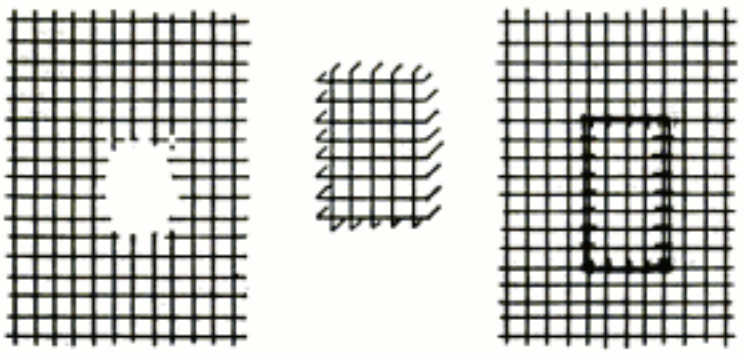
Forgotten and Locked in a Sealed Vault It Cannot Be Reached--Remarkable Performance.

There is burning, or was when this was written, an ordinary 16-candlepower incandescent lamp, which has burned continuously for more than 20,000 hours, and still shows bright and even. This remarkable performance which is believed to break all records, is purely accidental. Over 27 months ago one of the storage vaults in the county building in this city was filled with papers that cannot be destroyed, but which are no longer referred to. When the vault was closed and officially sealed a careless clerk forgot to turn off the incandescent lamp which lights the vault. The entrance to this vault is many feet above the floor, and when it was closed the iron stairway which led to it was taken down. Some months later light was discovered shining through a small crack at the bottom of the door, and since then it has been watched every day to see if the light still burns. It has now burned continuously more than 20,000 hours.

The average normal life of a 16-candlepower bulb is from 500 to 600 hours, under ordinary conditions of being turned on and off at frequent intervals. The fact that this bulb has not cooled since it was turned on, and that its work has been of a uniform, steady nature has largely contributed to its life. How much longer it will last no one knows, and each day adds new interest to this remarkable demonstration.

HOW TO MEND WIRE SCREENS

Trying to mend a small hole in a wire screen by using short pieces of wire is one way, but it is not nearly as good nor half as neat and quick as the method suggested by T. S. Cummings, 289 Forsythe, Ave., Detroit. Cut out a square piece of wire cloth a little larger than the hole to be covered. Bend the free ends on each of the four edges as shown in Fig. 2. Place the patch over the hole and holding a smooth piece of iron on one side gently bend and tap the free ends until they lay flat and tight on the back. Your patch is done and will last longer than the rest of the screen, nor will the wires catch on garments as people pass through a doorway.



Mending a Wire Screen.

SEEING AND SHAKING HANDS BY TELEPHONE

To discern every expression on the face of the one you are talking with, to hear his voice and feel the pressure of his hand, when separated by hundreds of miles,

Electric Hand Shake.

is the ambitious prediction of French scientists. Under such circumstances the physician could safely prescribe for a patient in another city. And yet it is only a generation or so ago that the telephone, wireless telegraph, airships, submarine boats, and even the telegraph, seemed every bit as impossible and unreal.

Some progress has apparently been made in seeing by telephone, in the work of J. B. Fowler, of Portland, Ore., but the French are determined to go much further. He has not as yet given out any details of his mechanism.

The illustration shows the line of operation along which the French are working.

CONCRETE CHIMNEY 307 1-2 FEET HIGH.

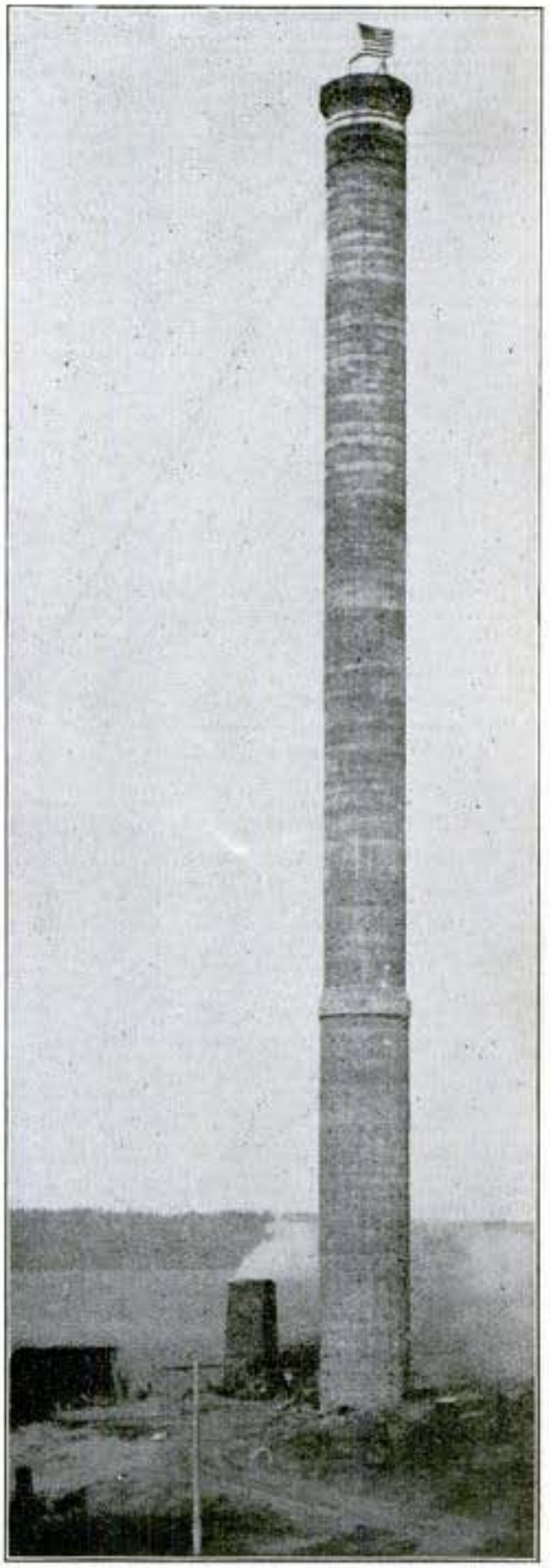
Greatest Engineering Feat of the Kind Ever Attempted--Structure Declared Tornado-Proof.

At Tacoma, Washington, the tallest concrete chimney ever built—the present marvel of engineers the world over—rises to a height of 307 ft. 6¾ in. and from its summit floats the true colors of a progressive age—the stars and stripes.

This wonderful chimney was built by The Contracting-Engineering Company of Tacoma for a smelter to carry away the deadly fumes developed in the reduction of ores at such height that the vegetation of the locality might not be injured nor the residents in the vicinity annoyed.

The chief dimensions of the chimney are as follows: Height, 307 ft. 6¾ in.; foundation, 6½ ft. deep, 39½ ft. square; inside diameter of chimney, 18 ft.; largest outside diameter, 21 ft. To a height of 90 ft. it is built double, the outer shell being 9 in. thick and the inner 4 in. thick, with a 5-in. air space between the two shells. The single shell is 7 in. thick and 211 ft. ¾ in. high.

The chimney was built in 3-ft. sections. The foundation is reinforced by networks of T-steel 1¼x1¼x3-16 in. and the chimney part is reinforced by vertical T-bars of the same dimensions ranging from 16 to 30 ft. in length, and encircled by rings of T-steel. All the work was done from the inside of the chimney, a scaffold being raised as the work progressed. Material was hoisted by means of a cable attached to the drum of the engine operating the concrete mixer. After the foundation was in, the construction occupied just 50 working days. The chimney cost $27,600. In its construction 1,225 bbl. of cement and 105,000 lb. of T-steel were used.



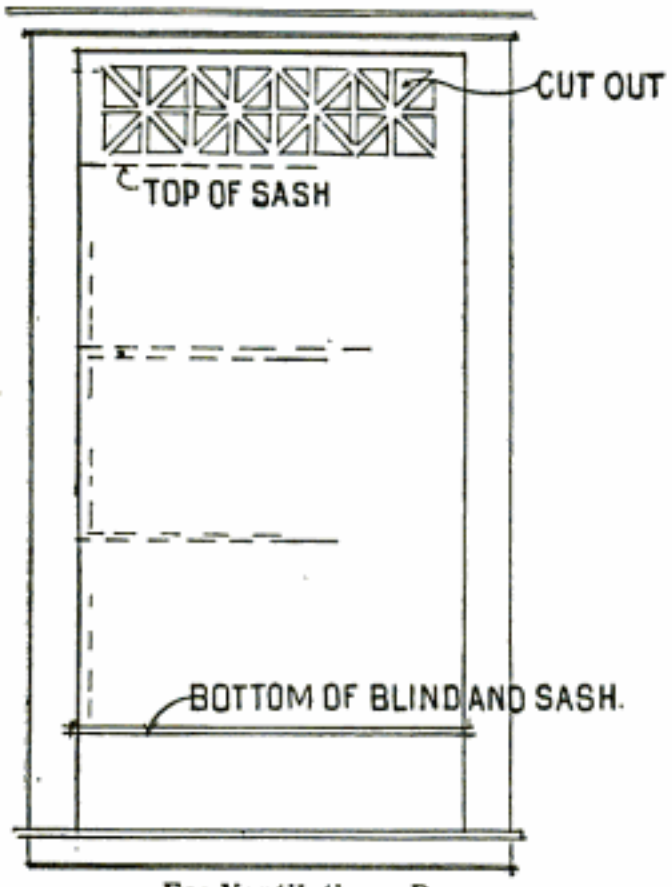
The Tallest Concrete Stack Ever Built.

ALL NIGHT DINING CAR

The railroads are constantly studying to devise new things with which to please their patrons. The very latest is the all night dining car which the Illinois Central has put on its midnight trains between Chicago and St. Louis. If you wake up in the night and feel the gnawings of hunger all one need do is press the button and forthwith be fed. And it does not seem so very long ago that the familiar "next stop 10 minutes for refreshments" echoed throughout the land.

TO VENTILATE A ROOM

I give below a little scheme which I have used with success for ventilating a room, especially to get rid of the superheated upper air in a room. It consists simply in cut-



For Ventilating a Room.

ting the upper of the window blind as per sketch and leaving the window about 9 ins. open at the top. The wear on the blind is not great and it keeps the ceiling cool all night. My room has been from 4 to 6 degs. cooler since I tried it.—Contributed by G. D., Chicago.

ENGLISH NAVAL TRAINING SHIP

A new training ship, the "Exmouth," has been added to the British navy. The vessel is 300 ft. long with 53 ft. beam, and is 39 ft. to the upper deck. To immerse the vessel sufficiently to give her stability a keel box 6 ft. deep has been fitted and filled with several hundred tons of concrete. The Shipping World says:

There are four complete decks. The upper deck is reserved for drill purposes, and a special band-stand is arranged at the after part of the forecastle deck. The captain's quarters are fitted aft. Forward there are the boys' lavatories, drying-room, and band-room.

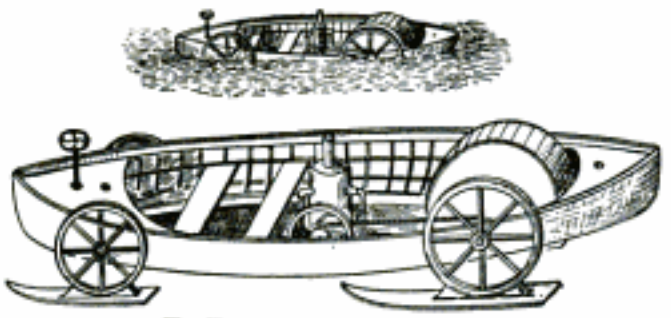
On the main deck there is accommodation for the committee, chief officer, cap-

New English Training Ship.

tain's kitchen, and aft and forward the tailors' and carpenters' shops. There are over 200 hammocks slung on this deck. During the day there are sufficient seats to accommodate all the boys for church service and lectures. The lower deck is the mess-room; aft there is the gun-room for the officers. The tables in the boys' mess fold up to the roof at night, to afford space for hammocks. At the extreme forward end is the boys' galley, fitted with the latest cooking appliances. The orlop deck forward is given up for boys' hammocks, and the after part to six school-rooms capable of seating 300 scholars. Below the orlop deck the space is devoted to storerooms. At the forward part there is the electric plant for heating, lighting, and ventilating the ship.

A UNIVERSAL AUTOMOBILE

An automobile designed to travel equally well on land, snow or water has been constructed by Lee R. Clarke, Middle Creek Canyon, which is near Bozeman, Montana. Mr. Clarke sends photographs of his machine which is illustrated herewith. A gasoline engine of suitable power is connected by a sprocket chain to the rear axle, which



To Travel Land and Sea.

will drive the running wheels when on a roadway, or the paddle wheel when in the water. For use on snow four steel runners are attached and the blades of the paddle wheel are changed to steel spikes or spurs.

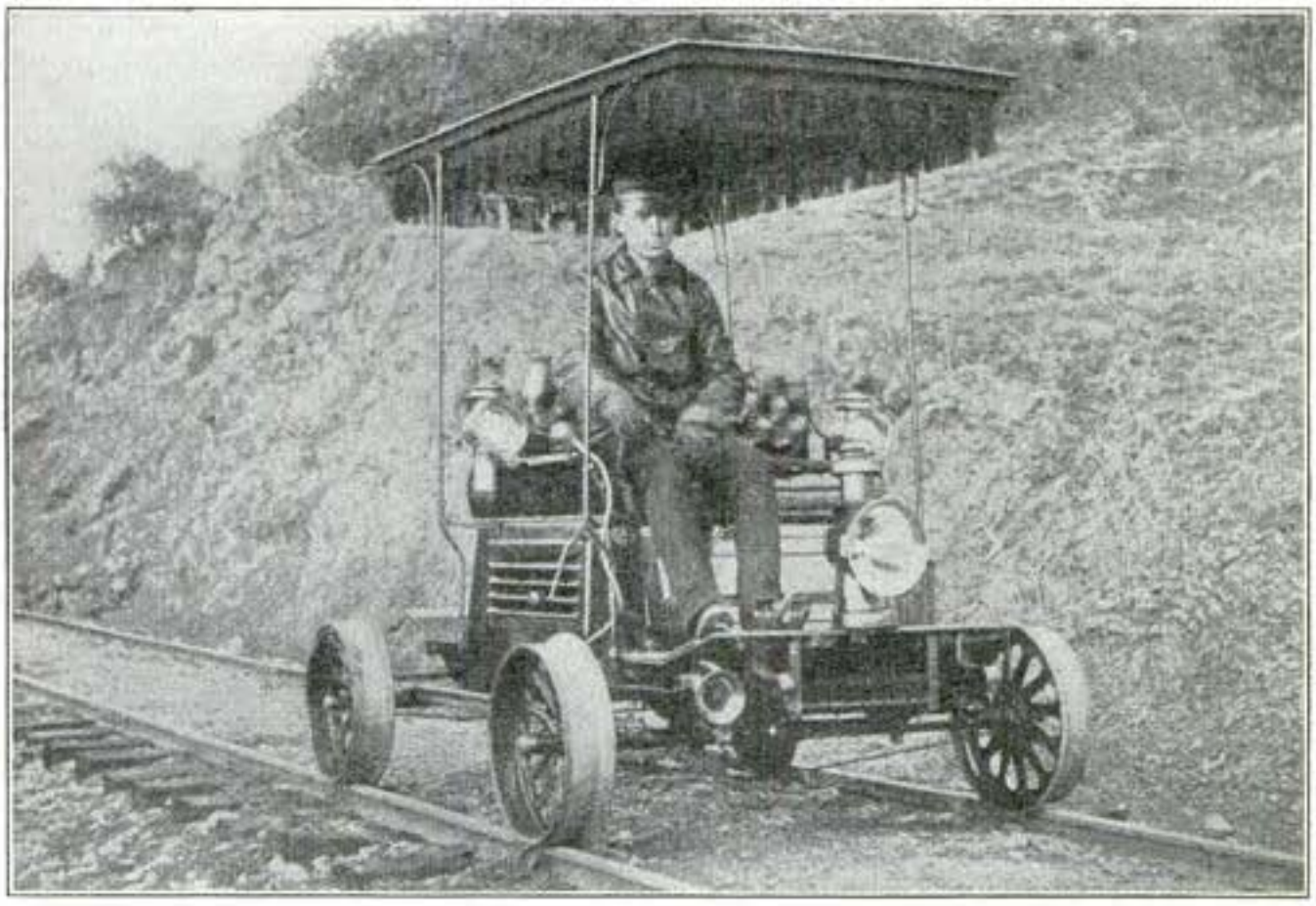
DESIGN OF STEEL PASSENGER CARS.

The full efficiency of steel passenger cars will never be brought out until in design they cease to follow the outlines of the old wooden cars. This was true of the first steel freight cars, also, and when later a decided departure from the old construction was made, many points of advantage afforded by the new material were made use of. Some of the best features of steel freight cars could be adapted to steel passenger cars with advantage. The Railway Age says:

"The center sills should be made deep enough to serve for the direct attachment of the draft gear, and they should extend clear out to the platform end sill. As the sills are lowered and with them the body bolster and center plate the truck center plate will be nearer the top of rail and to accomplish this properly a radical change will be required in the truck. There has been so little change in passenger truck design for many years, and the present practice has served so well, that there may be some hesitation about making any material modification in it for the purpose of adapting it to good design in steel underframes. It will be found best in the end to make the design for the steel underframe as it should be and then adapt the truck to it."

AUTO RAILWAY PASSENGER CAR.

The most novel observation car ever used on a steam railroad is now in operation on the Sierra Railway of California, and has proved a decided success. The car is used on one of the Yosemite branches and will carry three passengers and the operator; it affords an unequalled opportunity for enjoying the magnificent scenery, and can be run at slow speed where the passengers so desire. A gasoline engine of 4½ hp. furnishes the power.



An Observation Auto Car

SUBMARINE MINES TO BE DISCARDED FOR SUBMARINE BOATS.

Submarine boats as a means of harbor defense are likely to be substituted by this government for the submarine mines heretofore used. The war in the Far East has demonstrated that the mines are not wholly satisfactory, Russian vessels having been blown up by mines set for their enemies. In wide channels the strong current is apt to carry the mines from the point where they were laid, and thus they become an equal menace to both foes. England's policy of discarding the mines for submarine boats is looked upon with approval by naval authorities in this country.

THE FINEST STREET TELEPHONE SYSTEM IN THE WORLD

The finest system of street telephones in the world, the most conveniently and comfortably arranged and having the most numerous booths, is found—not in New York, nor in London, Paris or Berlin—but in Stockholm, Sweden. In that city the telephone has been grafted on the daily life of the inhabitants until it has become an indispensable member. Street telephone pavilions are found at every cabstand, theater, restaurant and in every thoroughfare, and they open automatically by dropping a coin into a slot.

Interior of Telephone Pavilion.

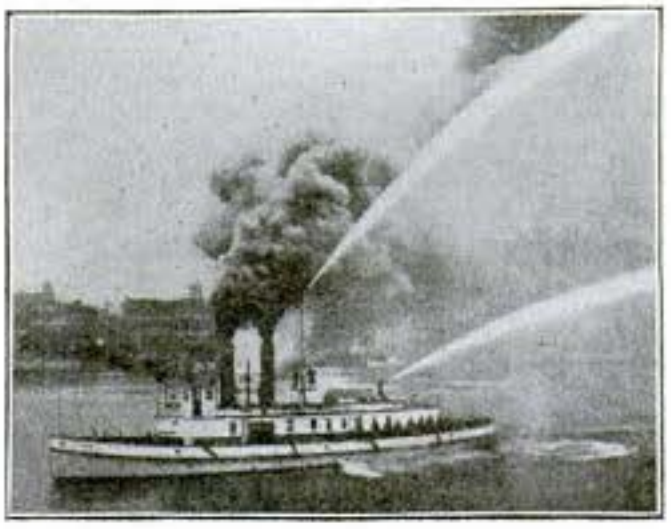
Telephone Pavilion Closed.

The booths are of attractive design and architecture. The floor is several inches above the pavement or ground, as the case may be, so the person using the 'phone stands out of the damp in the most inclement weather. Each station has a gas jet which is kept lighted at night. A remarkably large patronage follows as the consequence of this convenient arrangement.

FIRE BOAT AT PORTLAND, OREGON

The First to Use a Water Tower.

This new fire boat, one of the finest in the country, has gone into service at Portland, Oregon. The boat will throw ten 3½-in. streams, and has also a 6-in. monitor on the wheel house, and a 4-in. monitor amidships.



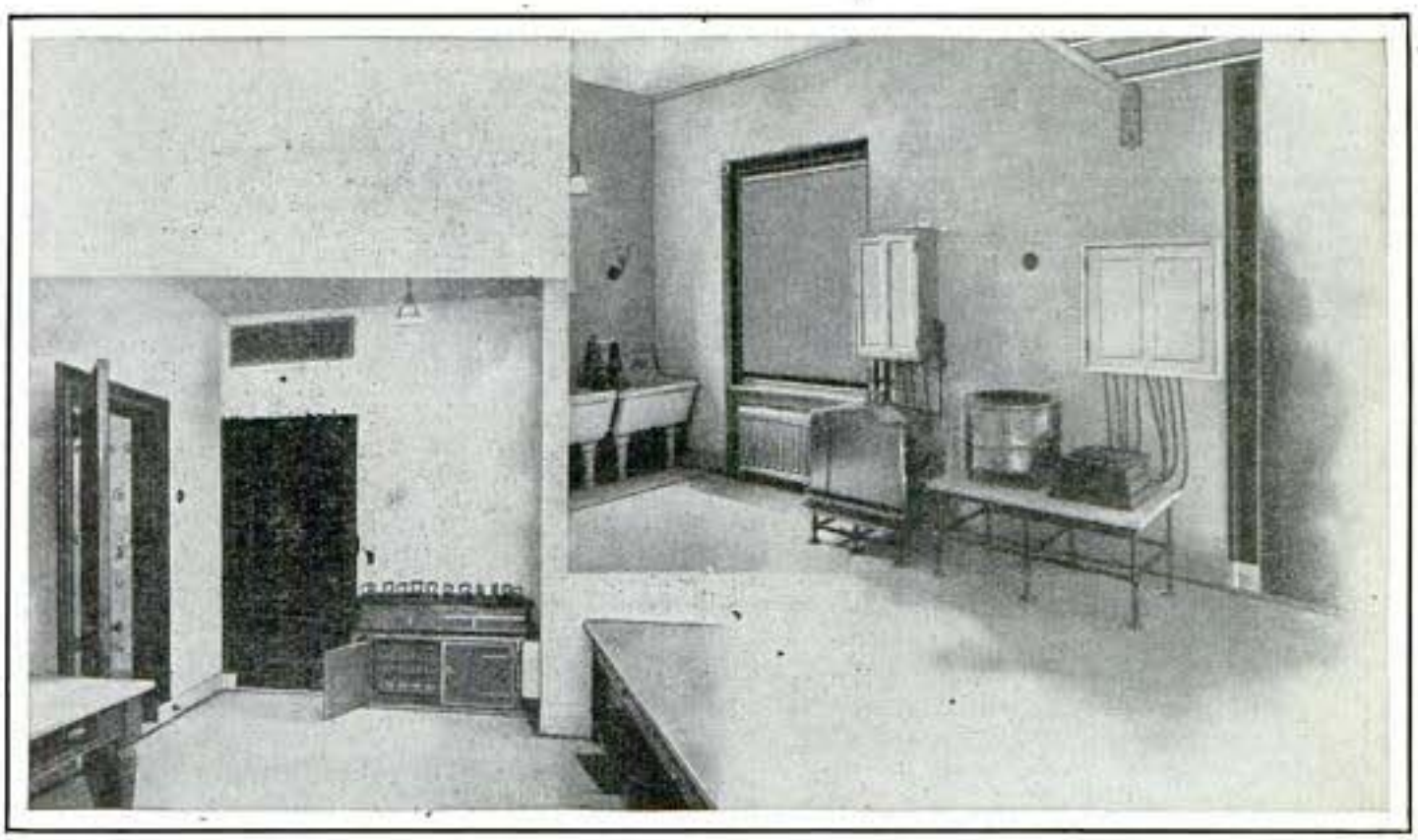
Portland, Ore., Fire Boat

A water tower is also located amidships and is the first ever installed in a fireboat. The illustration shows the water tower throwing a 2½-in. stream from a height of 45 ft. above the water line. The success of this feature will doubtless lead to its general adoption.

At the test 150 lbs. steam was raised from cold water in 6½ minutes. The boat will always carry 150 lbs. steam, which requires about one-half ton of coal per 24 hours, and when in action will increase the steam pressure to 250 lbs., which is done in a few minutes.

ELECTRICITY THE IDEAL HEAT

System of Electric Heating in Andrew Carnegie's New York Residence



Views of the Electrical Laundry in the New York Residence of Andrew Carnegie

One of the most perfect and up-to-date installations of electrical heating is in use in the residence of Andrew Carnegie on Fifth avenue, New York, says the Bulletin of the New York Edison Company. Throughout the house the equipment is most complete, including all the heating contrivances which make for comfort, utility or pleasure, such as a handsome plate warmer and other devices.

Our illustration shows two sectional views of the laundry, which is as nearly perfect as possible, and also as comfortable to work in as a laundry can be. This electrical equipment has been in continuous operation for two years and has been found entirely practical.

NEW CHLOROFORM INHALER

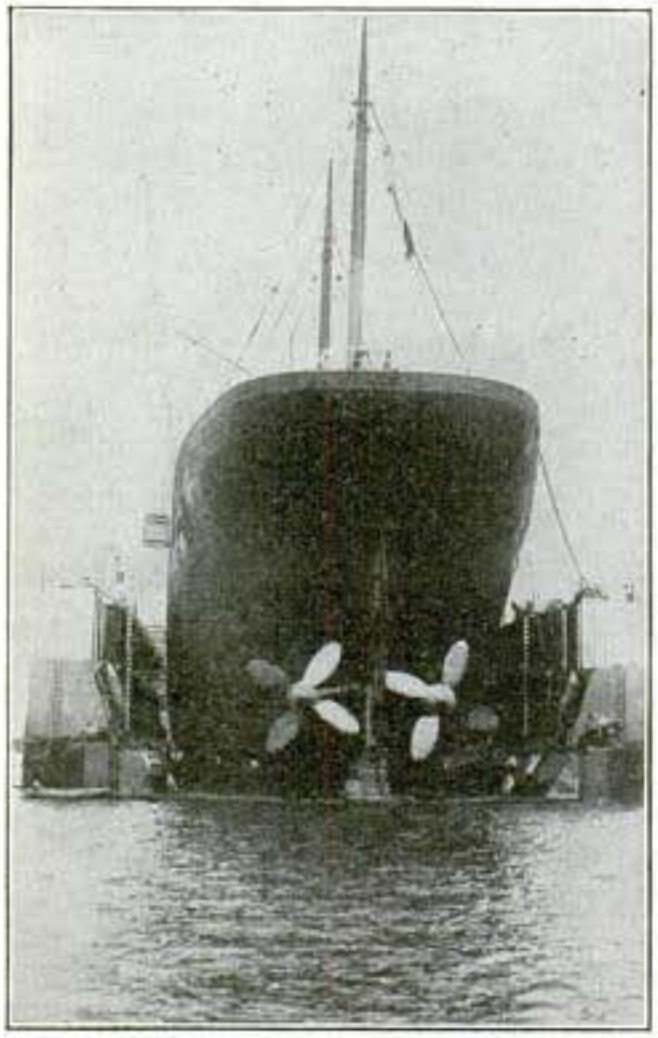
A "one-handed" chloroform inhaler has been devised by Dr Wright of Douglas, Ariz. It is specially intended for cases where a surgeon must work without assistance or where only a slight anesthetic is required The Journal of the American Medical Association says: A rubber cork, pierced by two metal tubes, is inserted into a wide-mouth bottle of about two ounces' capacity. One of the tubes extends just beyond the bottom of the cork and is connected at its upper end with a rubber bulb. The other tube extends to the bottom of the bottle; its outer portion is curved so that its extremity, drawn out to a very fine point, looks downward. An ordinary mask is attached to the bottle by a spring collar, being placed nearer the bottom than is shown in the illustration. By intermittent compression of the rubber bulb a very fine stream of chloroform is projected on the mask; the amount can be regulated at will. The bulb, bottle and mask are easily taken apart and packed into a compact bundle, which occupies very little space in an obstetrical bag.

The Cunard steamship "Campania" on a recent voyage across the Atlantic was in communication with both Europe and America by the Marconi system of wireless every day of the voyage. This is the first time this has been accomplished.

SHIP REPAIRS AT DURBAN, NATAL

The enclosed photographs show the Atlantic Transport Company's s. s. "Maine" on the Durban Floating Dock.

This is the dock which was built in England and towed to this port, a distance of 8,600 miles, as fully described in Popular Mechanics for July, 1904.



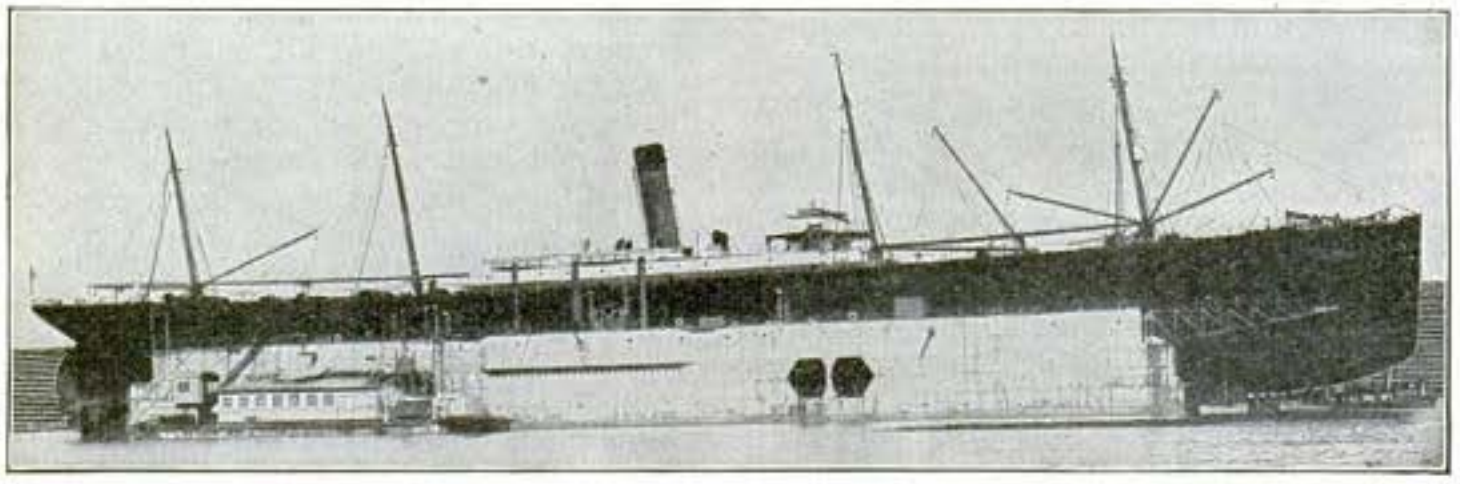
Stern View in Dock

The "Maine" was bound for Manila with a cargo of 9,000 tons of coal (for the American navy), and on the 20th of February, 1905, in thick weather, she struck an aluvial shoal, 26 miles west of Durban, Natal. She arrived at Durban in a sinking condition, her Nos. 2 and 3 holes being full of water. A portion of her cargo was jettisoned and placed in lighters, special pumps being supplied by the harbor department to keep her afloat. On the 23rd of February she was brought into the inner harbor drawing 30 ft. and divers were employed to keep her afloat by temporarily stopping the leaks. Pumping operations were continued and the cargo was discharged at the Bluff wharf. On the 14th of March she was placed on the dock and raised sufficiently to drain the water out of her tanks, and the next day she was fully raised. The damage to her hull is very considerable and it was decided to temporarily repair her and send her to Belfast to be properly repaired. Dead weight of s. s. "Maine" was 8,240 tons; capacity of dock, 8,500 tons.

The s. s. "Maine" was patched up and left Durban on April 6th.—Contributed by D. Graham Crofts, Durban, Natal, S. A.

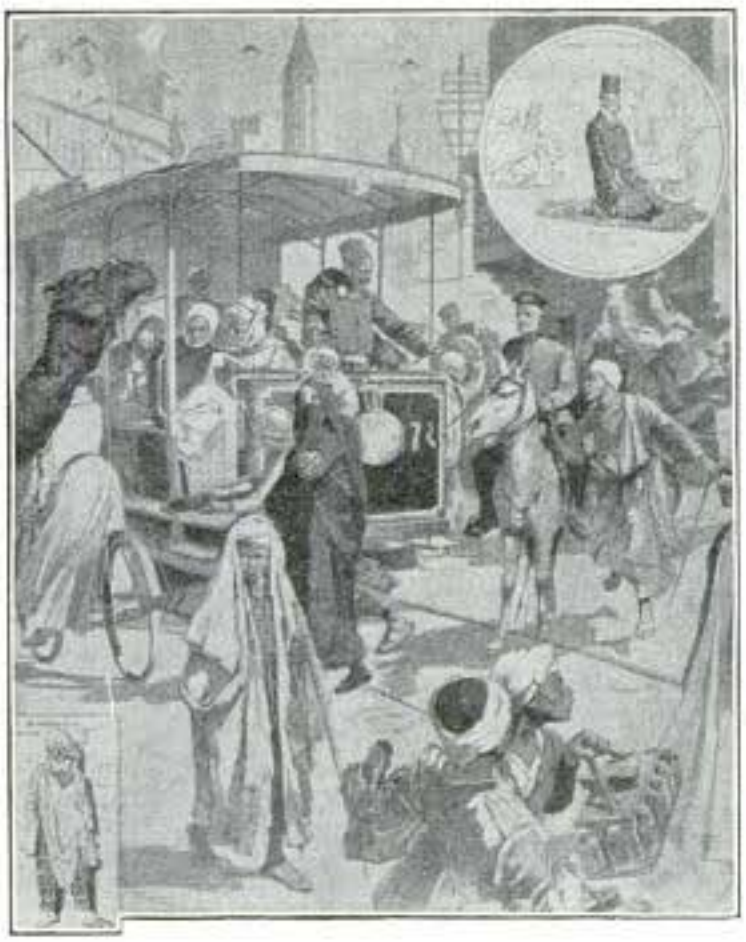
WIRELESS TELEGRAPH AT THE NORTH POLE.

The dangers of Arctic exploration, into which Lieutenant Peary is again about to enter with all his old zest, will this time be greatly diminished, it is hoped, by means of wireless telegraphy. When men's minds are strained to the limit by the darkness and the extreme cold, a message from the world left so far behind them will flash across untrodden tracts of ice and snow and rekindle hope and ambition. Wireless stations will be erected at suitable distances so the explorer's vessel can keep in touch with the nearest station on the Labrador coast and from there with the Washington station. If the Pole is discovered the news will be telegraphed to Washington immediately.



Steamer Weighing 8,240 Tons Lifted Bodily Out of the Water at Durban, South Africa

TRANSPORTATION IN EGYPT



The Old and the New Methods of Transportation as Seen Daily in Cairo, Egypt.

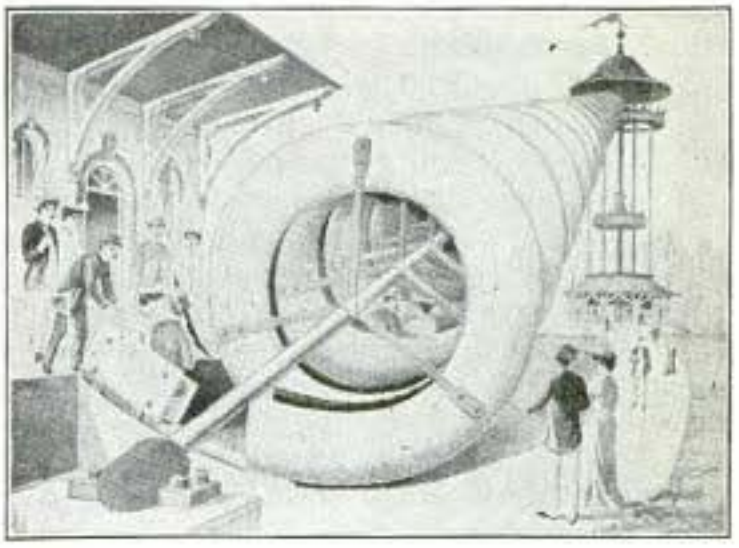
DOUBLE DECK AUTO-BUS, LONDON

The Londoners like to ride on the roof, hence their street cars and buses are all "double-decked." Since the motor-bus has come into quite general use there has been a demand for outside seats. The illustration from the Automobile shows one of these latest mechanical creations. The vehicle uses gasoline engines of 30 h. p. and accommodates 16 passengers inside, 18 on top, and 2 beside the driver. The engines are cooled by circulating water, and consume 1¼ gal. gasoline per hour when running. The supply tank holds 12 gal. of gasoline. The machinery is beneath the body of the car.

London Two-Deck Motor 'Bus.

THE "ARCHIMEDEAN SCREW," THE LATEST AMUSEMENT DEVICE

Among the new amusement devices which will be put into use this summer is a novel adaptation of the Archimedean screw. The device consists of a huge spiral, formed of a trough having its open side on the inside of each convolution and rotated on a central shaft. Cars carrying two or three passengers travel on tracks in the trough beginning at the lower end of the spiral and mounting upward as the car, impelled by gravity, seeks to run to the bottom of each convolution in turn. As the spiral rotates, the car can never reach the bottom of the convolutions and so progresses through the whole series until it reaches the top, 40 or 50 ft. above the ground, where the passengers dismount on a platform and the car runs down an inclined plane back to the starting point.



An Ingenious Amusement Device

Here the passengers mount a circular car formed with a nut threaded on the huge vertically disposed screw which supports the spiral at that end. The operator controls this car so that the sections of the nut grip the screw and carry the passengers round and round and downward. The car is raised to the top by counter weights. The device is the invention of J. J. Carr of Brooklyn, New York.

AMERICAN MOTOR LEAGUE PROTECTION

The American Motor League is now sending to its members a red leather disk, three inches in diameter which entitles the owner to the assistance of the league in case of

malicious damage to the machine or its occupants, and also insures prosecution in event of theft. The two sides of the disk are reproduced in the illustration.

THE HARNESSING OF HEAT

PART II.--FUELS

Practically the only method of producing heat which is at our disposal involves the use of fuels. They exist in three distinct forms—solids, liquids and gases, but the active material which gives them their value is the same in each case. This material is principally carbon. Coal is the most common fuel, and contains a varying amount of carbon, according to the kind of coal and the locality from which it is taken. Anthracite or hard coal is almost wholly carbon. Bituminous coals contain from 60 to 80 per cent carbon, a little hydrogen and other volatile matter, and from 5 to 10 per cent of ash or incombustible matter.

Coal is the remnant of a very luxuriant vegetation that flourished ages ago. In some bygone age, when conditions were much more favorable to the growth of plant life than they are now, plants and trees grew to an enormous size and in great abundance. Their fallen remains were crushed down into the earth, and there changed into coal, and preserved for the use of future generations. We know that this is true from the remains of trees and leaves of plants which the miner's pick uncovers at the present day.

When coal is burned, the carbon and other combustibles present, combine chemically with the oxygen of the surrounding air, the latter being as necessary for the process as is the coal itself.

For completeness of combustion, the first condition is a sufficient supply of air; the next is that the air and the fuel, solid and gaseous, shall be thoroughly mixed, and the third is that the elements—air and combustible gases, shall be brought together and maintained at a sufficiently high temperature. The hotter the elements, the greater is the facility for good combustion. The ever existing attraction between the carbon in the coal and the oxygen in the air represents a certain definite amount of energy, or power to do work. There is enough energy in one pound of the best anthracite coal, if none were wasted, to lift itself from the surface of the earth to a height of 2,000 miles. How little of this supply of energy is man able to use, with his imperfect methods and appliances!

The carbon in coal may unite with the oxygen of the air in two proportions. In the first, or incomplete combustion, one part of carbon, by weight, combines with 1.33 parts by weight of oxygen, forming a gas called carbon monoxide. This gas is poisonous, colorless, faintly odorous and slightly combustible. It is the cause of many of the flaming blue streams of fire that hover above the coal in a furnace or stream from the throat of a blast furnace.

In the second, or complete combustion, there is formed a heavy, colorless, inodorous gas called carbon dioxide, consisting of one part, by weight, of carbon, and 2.67 parts by weight, of oxygen. This is the same gas which we breathe from our own lungs which are in themselves a sort of furnace where the impurities of the blood are burned.

Not all of the coal is burned, however, in any case, for besides the ash and clinkers which always remain behind, there is always formed a certain amount of smoke. Now smoke consists mainly of finely divided particles of carbon mixed with the gases formed from combustion. Smoke is therefore an indication of imperfect combustion, and because of this, as well as for sanitary reasons, it is to be avoided. Smoke may be caused by an insufficient supply of air, so that the carbon does not have a chance to all burn; or it may be caused by a premature cooling of the gases which arise from burning fuel, so that they are no longer hot enough to burn, depositing the carbon they contain in the form of soot and smoke. Soft coal, in which much of the carbon is in the form of oily compounds, should be heated very slowly, and the

resulting gases given every necessary chance to burn completely if smoke is to be avoided.

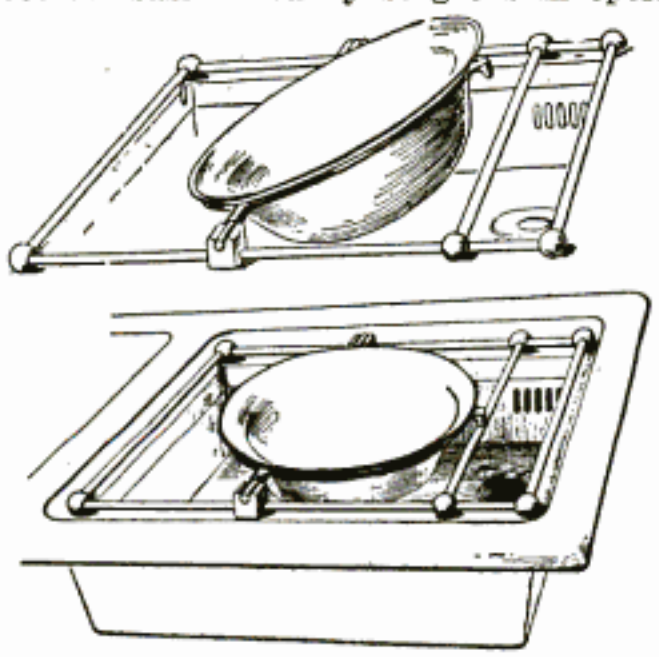
Liquid fuels, such as petroleum, contain carbon in chemical combination with hydrogen. It has been demonstrated that one pound of oil will evaporate as much water as two pounds of coal. The greatest advantage, however, in the use of oil as a fuel, lies in the great saving of labor which is possible by its use, and the complete control possible. There is no shoveling of coal, no ashes to be taken away, no banking of fires. The turning of a valve regulates the supply or extinguishes the fire altogether. The same may be said of gas as a fuel, especially if a supply of natural gas be available.

Fuels, therefore, form the first step in the harnessing of heat for man's service. Because of the energy stored up in them they generate, when burned, another form of energy—namely, heat. But heat as heat will not do work for us unless we apply it in certain prescribed ways. The next step will be to see by what means the energy of heat is transmitted into mechanical energy.

(Continued next month.)

SURGEON'S OPERATING ROOM BASIN

A frame which can be made at any plumber's shop for conveniently holding the porcelain basin used by surgeons in operations is described in the Journal of the American Medical Association. Dr. F. D. Gavin, of Baltimore, who devised the plan, recommends it highly to the profession. Any plumber can make one from an examination of the illustration.

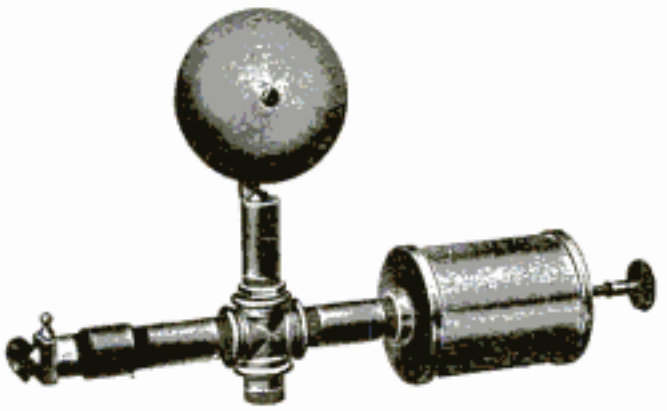


Basin for Operating Room

PNEUMATIC SIGNAL GONGS FOR MINE SPEAKING TUBES

A complete hoisting and communication system between shaft, engine-house and tipple is established in those mines where the new pneumatic signal gong is attached to the speaking tubes. A heavy bronze gong 8 in. in diameter, giving a loud clear signal, and having a stem containing a striker; a brass air-chamber, and an extra heavy brass speaking tube mouthpiece fitted with a whistle comprise the outfit that is connected to the pipe with the necessary fittings.

When a person at any station wishes to signal by means of the gong, he pushes the plunger of the air-cylinder into the cylinder, thus making a slight compression of air throughout the entire pipe circuit, says Compressed Air, and this compression causes the strikers throughout the system to rise and strike the gongs simultaneously, while a small amount of air escaping through the whistles causes them to sound also. As one compression, or push on the plunger, causes but one stroke of the gong and one blast of the whistle, a system of signals, consisting of a certain number of strokes for each tube may be arranged to suit individual requirements.



SPEAKING TUBE AND GONG.

The whistle is fitted in a gate slide in the speaking tube mouthpiece which is raised when persons are talking through the tube and falls back in place by gravity when they are through talking.

Two of the three new scout cruisers, with which the United States navy is to be furnished, are to be equipped with turbine engines of different type. The other vessel will have reciprocating engines. The vessels are required to make a maximum speed of 24 miles and the maximum price fixed by law is $1,800,000.

CEMENT POSTS THOROUGHLY TESTED

Farmer Tells How They May Be Manufactured, What They Will Cost, and What His Use of Them Proved to Him

About a year ago I received a booklet from my lumber dealer calling my attention to the merits of cement posts and asking that I try some and learn if they would answer the purpose of the general farmer. Perusing the little book closely, two questions occurred to me: First, will these concrete posts withstand the climatic action of our winter, or will they disintegrate? And if they will withstand the above influences, will the price (35 cts. each or 30 cts. by the carload of 650) justify a person in purchasing them in large quantities? To solve the first problem could only be done by purchasing some and awaiting the results of winter. I did so and placed 50 along a main road by the side of an orchard.

The novelty of the departure from the material we had all been using all our lives, caused many passersby to pause to admire the neat looking fence the new posts made, but the majority ventured their opinion (gratis of course) that when winter came the posts would snap off when stock rubbed against them.

Let me say right here their and my fears were groundless. They acted as well as any of the wooden posts. The next anxious question was, can they not be manufactured and purchased more cheaply, as the freight from the place where they were made had cost me 7 cts. for each post. There was a strong incentive to make them in our own yard where we could get the cement for 30 cts. per 100 lb. or $1.20 per barrel at the factory, which is close by; and where sand and gravel could be obtained at from 10 cts. to 20 and 25 cts. per load. By closely investigating I learned that to make a post 7 ft. long, 3 in. square at the top and 4 in. square at the bottom, would require 8 lb. of cement, 30 lb. of sand, 21 ft. of No. 11 wire and 10 staples (if you wish to use them as fasteners).

Some make holes through the posts for as many wires as are needed in the fence by putting a 60-penny spike through the post while the cement is soft, and withdrawing the spike before the cement sets too hard. Of course, a mold must be made for the size of post wanted. If a person has about 15 molds, two men can make 200 posts per day. There are various methods of making the posts, some use pieces of steel the shape of the section of a mowing-machine knife, about five of them, to steady or stiffen the wire. The method is to make a hole in the section at the point and use the two rivet holes. These sections can be purchased at about $2.00 per 1,000 and the staples that are in this shape can be purchased of barbed wire staple manufacturers at a little more than the price of common fence staples. There are many firms that have frames and fastenings for sale and there are also a number of firms that sell cement manufacturing outfits.

The writer of this article has learned by actual experience with cement posts during the last 15 months, that: They will withstand the action of our winter as well as any other kind of posts; that cattle will not break them, they being protected by the wire fence they hold; that any farmer, located where material is as cheap as it is in this vicinity, can make his own posts for 10 cts. each, not counting his time at 40 cts. per hour; that the wire running through the posts is a positive protection for stock while they are near the fence during electrical storms.

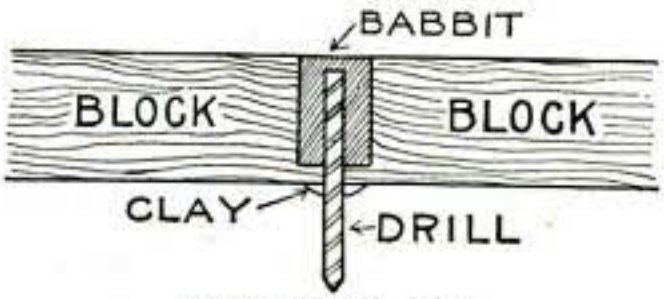
In January I wrote a short article in Popular Mechanics for the purpose of calling the attention of my fellow farmers to the difference between the cost of construction of cement posts and the price the dealers are selling them at. In less than three weeks I began to receive letters of inquiry from farmers in Nebraska, New York, Wisconsin, California, North Carolina, Arkansas, South Carolina, Indiana and Illinois, and I am still receiving them. It is for this reason that I earnestly desire that Popular Mechanics will publish all the information it has access to, and give the farmers all the details of a subject that interests some six or seven millions of people.

The writer verily believes, from the year's experience he has had, that in five years these posts will be used by the millions. These, with a strong woven wire fence, say 40 in., with one top barbed wire will be the coming fence.—Contributed by T. A. Pottinger, Peru, Ill.

SHOP NOTES

HOW TO REPAIR A BROKEN DRILL

Procure a block of wood a little thicker than the length of the shank of the drill and bore a hole of the same size as the shank nearly through it. Bore through the rest of the way with a bit the size of the drill. Insert the drill in the hole as shown



Repairing the Drill

in the illustration and press clay or putty around it in the small hole from the underside. Run babbit in the chamber made in the block, allow it to cool, and then burst the block apart and the repaired drill is ready for use. It will bear much longer service than may be imagined and the repair will be found useful when the supply of drills fails unexpectedly.—Contributed by Eli Tolliver, Louisville, Ill.

THE STEAM BLAST AS A PROTECTION FOR THE BRIDGE WALL?

A steam blast introduced under a grate would do more harm than good, says a correspondent of Power, and where it is desirable to increase the draft, a blower set is the proper innovation.

The illustration shows the probable effect, if a steam pipe were placed below the grate

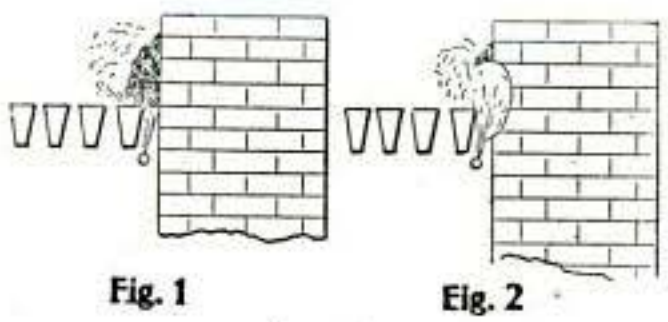


Fig. 1 Fig. 2

as in Fig. 1. The shaded portion represents clinkers adhering to the bridge wall. In dislodging the clinkers, the steam would take with it a small part of the wall until an effect as in Fig. 2 would gradually result.

HOW TO MAKE AN AIR-HAMMER

An air-hammer, such as shown in the illustration, will be found handy for straightening round and flat iron at the scrap pile and may be home-made, says the American Blacksmith.

The anvil of the hammer is a cast iron block and the hammer is made of an 8-in.

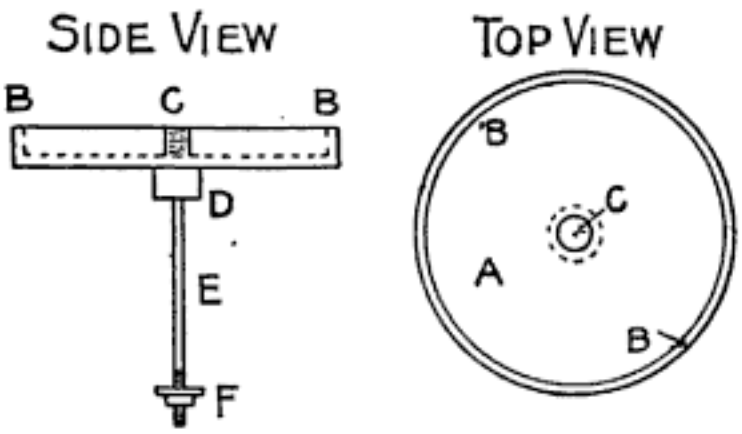
Air-Hammer for Straightening Scrap Iron.

railroad air brake cylinder. In the one shown, an old mortising machine was used for the frame, but it could be made of old channel irons, or a wooden post could be used. A foot treadle connected to the valve on the top of the cylinder by a rod operates the hammer and both hands of the operator are left free to handle the rods to be straightened. All round stuff up to 1¼-in. diameter may be straightened by this device. Of course the machine is usable only in shops having compressed air.

Contributions to this department are invited. Have you a practical idea for us?

FIXTURE FOR A DRILL PRESS

A simple, cheap and efficient fixture for a drill press is shown in the accompanying illustrations. It consists of a casting, A, with a flange, BB, a lug, D, to fit the center hole of the drill press table and a stud, C, the same size as the lathe spindle nose.



Fixture for the Drill Press.

In using, the fixture is placed on the drill press table with the boss, D, in the central hole. The fixture is then securely fastened by means of the washer and nut, F, on the rod, E. An universal or scroll chuck from a lathe is then screwed on the stud, C. This chuck is supported by the flange, BB.

The idea may not be new but it is a good one. By the use of the fixture much work can be done on the drill press by a cheap man that would ordinarily require a good man on the more expensive lathe.—Contributed by E. M. Davids, 958 Grand View St., Los Angeles, Cal.

HOW TO BRAZE A BROKEN GLAND

A gland which suffered injuries that broke off about two-fifths of the flange and took out one of the three stud holes in the gland, was repaired by a correspondent of the Engineer's Review in the following manner:

A piece of ⅛-in. sheet iron, the size of the gland and having a hole for the rod to fit, was cut out as in Fig. 1. In both flange and sheet-iron piece five small holes, less than ¼ in. were drilled to correspond, and the plate was riveted to the gland. A charcoal fire was then built in the forge, and the gland, flange downward, slowly heated till red hot, when borax was poured over the fracture until sufficient to flow into all the crevices. Bits of brass were then placed along the line of fracture, enough to fill all space between the plate and the gland, Fig. 2, and in the crack in the flange, also. The part was then heated until the brass flowed freely into the joint when it was removed from the fire and allowed to cool. The stud holes were then bored and the piece dressed off. This repair was made in 1882 and two years ago was still in good order.

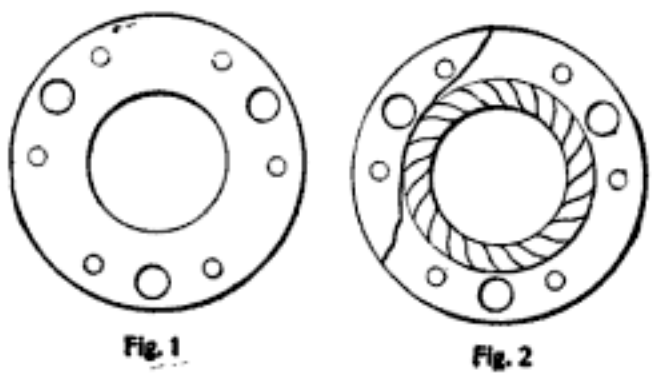


Fig. 1

Fig. 2

COLORING CONCRETE

[Excerpts from paper by J. P. Sherer read before the convention of the National Association of Cement Users.]

All coloring compounds containing acids or greases (including lamp blacks and graphites), are detrimental to concrete. For this purpose ground colored natural stone and mineral iron oxide are most desirable, in that they do not weaken or damage the setting qualities of the stone, but add materially to the strength of the finished product.

It is more satisfactory and cheaper to color the entire block than to use the facing plan. The color of the mixture wet must be many shades darker than the shade it is desired to obtain. For a strong deep cherry red from five to seven pounds of pure mineral oxide per cubic foot of concrete should be used.

TEMPERING STOUT SPRINGS

The following method may be used on springs for almost any purpose with excellent results:

Smear the spring with oil or tallow and hold it over a clear fire, or in a hollow fire, or place in a large iron pipe and put in the midst of the fuel of an open fire. Heat the spring until the grease burns off with a blaze. Probably the ends of the spring will heat first and the grease begin to burn there. If so, remove from the fire the moment this happens and immerse in oil, but do not quench entirely. Remove from oil and reheat, and if the ends again heat first, immerse in oil again. Repeat this operation until the oil burns uniformly on all parts of the spring. Cool by whirling around in the air.

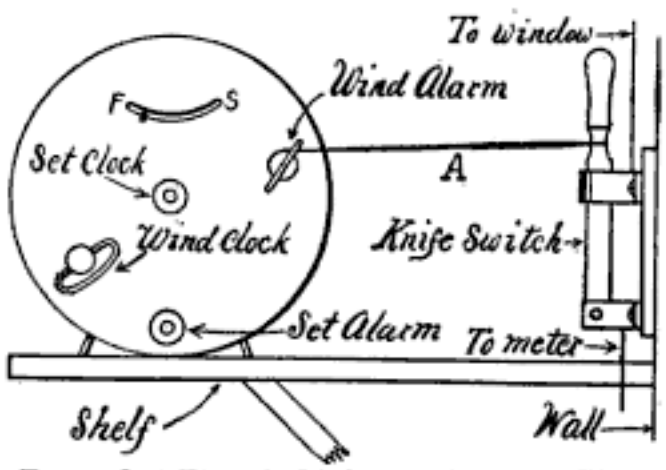
INSPECT THE SHAFTING AND SAVE POWER

Shafting which is out of alignment, belts which are too tight and bearings which are improperly fitted or insecurely supported are all excellent means of wasting power, says the Practical Engineer. Regular inspections of couplings and shaftings will pay for themselves in the power saved and the reduced expense in generating power. Pulleys placed too far from the shaft hangers spring the shaft, thus wasting power and perhaps heating the journals. Small pulleys waste power also, as they necessitate straining the belt too tightly.

AUTOMATIC DEVICE FOR TURNING OUT ELECTRIC LIGHTS

Merchants will find convenient a device which will automatically turn out the electric lights in their show windows some hours after they have left their places of business.

Such a device is shown in the sketch and may be rigged up accordingly. An alarm clock and a knife switch are the essential parts required. A in the diagram is a string having one end tied around the switch and the other end tied to the alarm winding key on the clock which has the bell removed. When the alarm rings, the string winds up, thus pulling out the switch and



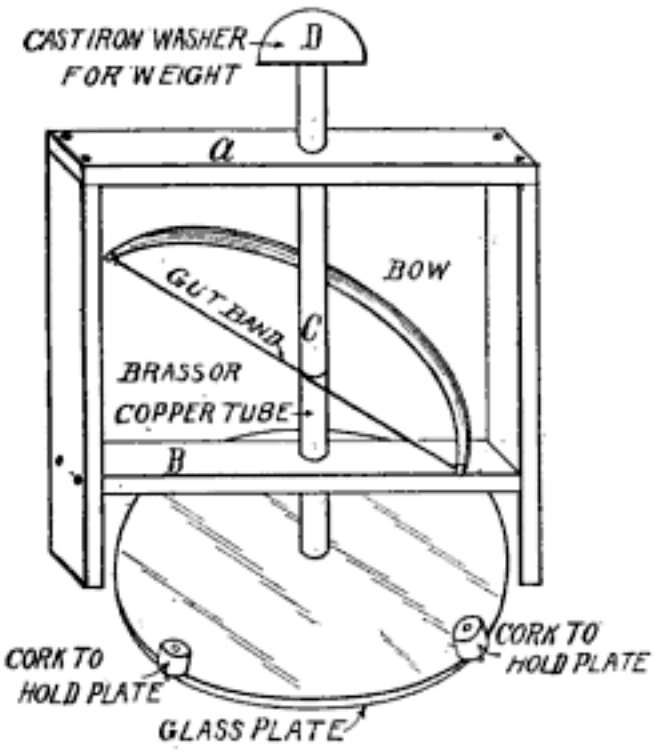
Turns Out Electric Lights at Specified Time

so breaking the circuit. If a merchant leaves his store at eight o'clock and wishes the lights turned off at twelve, he just sets the alarm for twelve o'clock and winds it up, closes the knife switch and may go home assured that exactly on the hour the lights will be turned off.—Contributed by G. Russell Noble, South Haven, Mich.

METHOD OF DRILLING HOLES IN GLASS PLATES

The apparatus shown in the illustration is used for drilling holes in glass plates such as are used in static machines. The frame is very easily made and the sketch explains its construction.

Procure a copper or brass tube the size of the hole it is desired to drill in the glass,



Drilling Holes in Glass Plates

and bore holes in the crosspieces, A and B, just large enough for the metal tube to pass through and have room to turn freely. If these holes are too large, the hole drilled in the glass will not be round, nor of the size desired; if too small, the tube will not turn freely.

Make a bow, such as a boy uses for shooting arrows. Pass the tube through the hole in the upper crosspiece of the frame and make one turn around the tube with the string of the bow, as at C. Then pass the tube on through the hole in the other crosspiece. Fasten a weight on the top of the tube as at D, and the apparatus is ready for use.

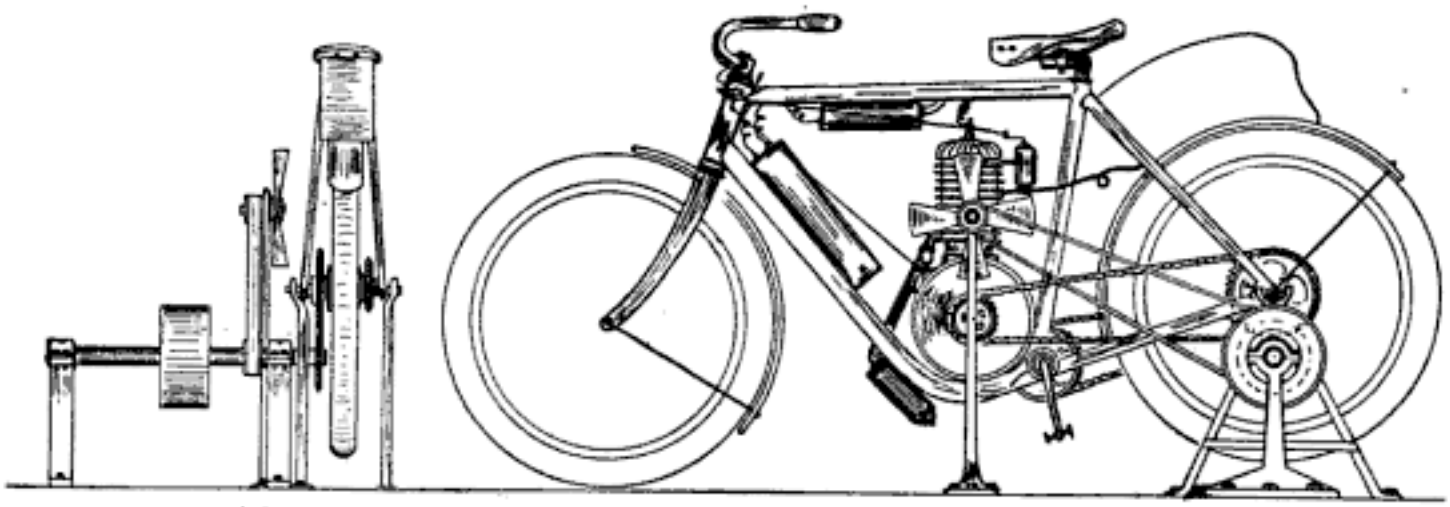
Fasten the frame on a perfectly flat table, put the glass plate under the framework and fasten it down with nails driven through corks. Put a small quantity of emery dust moistened well with turpentine into the tube and, grasping the bow, saw back and forth, so causing the tube to revolve alternately toward the right and left. In a short time a clean round hole in the glass plate will result.—Contributed by W. J. Slattery, Emsworth, Pa.

CEMENT FOR SLICKING LEATHER FILLET ON BRASS PATTERNS

Melt together 2 parts rosin and 8 parts pure beeswax, let cool, cut into strips, and apply with a slicking tool of the proper radius. The best tool for the purpose is made by setting a piece of wire into a steel ball and heating over a Bunsen burner. In applying, warm the pattern slightly so the cement will flow between the leather and brass. When cold any excess cement may be removed with a piece of waste soaked in spirits of turpentine.

MOTORCYCLE FOR SHOP POWER

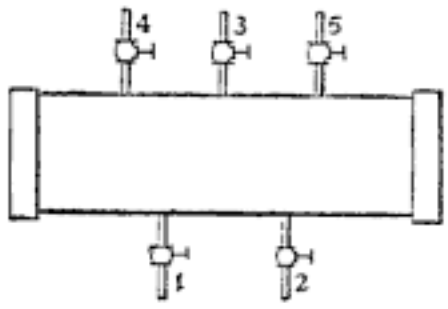
In one of your "shop notes" in the May number I notice the article of using a motorcycle for shop labor by placing it on a stand and connecting the drive wheel to a shaft. I do not wish to criticise this article, as I think it very good, but merely offer a suggestion and enclose a drawing. It is a well known fact that a gas-engine heats up very rapidly to its own destruction unless cooled either by water or air cooling fins on the cylinder. For motorcycle use, the air-cooled is generally adopted because its rapid passage through the air causes the air



to circulate freely around and through the fins, cooling the cylinder perfectly. Now, if the same machine is installed in a building on a stand where there is little or no moving air, it is clearly seen that the cylinder can not be cooled unless some device is used to produce an air current, such as a fan, as shown by my drawing. If this plan is used also, I see no reason why the use of a motorcycle for shop work should not be a success.—Contributed by Prentice P. Avery, Ridgewood, N. J.

DEVICE FOR TESTING VACUUM GAUGES

The illustration shows a device designed by a correspondent of Power for testing vacuum gauges. It consists of a piece of 4-in. pipe, capped at each end and tapped for five ¼-in. nipples as follows: No. 1, live steam inlet; No. 2, for the condensed drip; No. 3, high pressure gauge connection from which the high pressures may be tested;



Nos. 4 and 5, connections to the two vacuum gauges, one of which is a standard. In operation, steam is admitted through the live steam inlet till the high-pressure gauge registers 100 lbs. pressure, when the steam is turned off and cold water applied to the outside of the pipe. This condenses the steam and forms various amounts of vacuum. The gauge under test can be compared with the standard gauge, and corrections noted.

MAKING BLUEPRINTS FROM PENCILED DRAWINGS

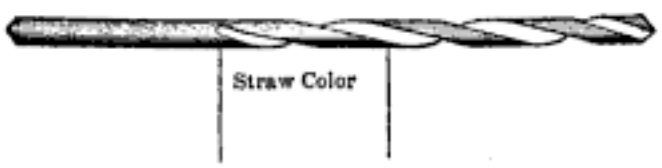
Blueprints can be made from pencil drawings by using rapid blueprint paper, a pencil tracing and good sunlight, an exposure of one minute only being necessary, says a correspondent of the American Machinist, who recommends the method highly as simple and wholly efficient. The 2-H. grade of pencils is stated as the best for the purpose.

HOW TO BLUE GUN BARRELS

The gun barrel should first be cleaned free from grease, oil or varnish. Dissolve 4½ oz. hyposulphite of soda in 1 qt. water and make another solution by dissolving ¼ oz. acetate of lead in 1 qt. water. Mix the two solutions and heat to the boiling point in a porcelain dish or stone pot. Warm the cleaned gun barrel and, using a piece of sponge tied to a stick, smear it with the hot solution. When the color has developed, wash the gun barrel, wipe it dry, and finish with boiled linseed oil.

HOW TO KEEP SMALL DRILLS FROM BREAKING EASILY

Small drills will not break so easily, says a correspondent of Machinery, if at the section indicated in the illustration they are drawn to a straw color. This treatment reduces the brittleness of the drill at that point and makes it less liable to snap off in the hands of the men and boys, who are not always so particular about handling tools.



To Keep Small Drills From Breaking

TO MAKE DASH-POTS NOISELESS

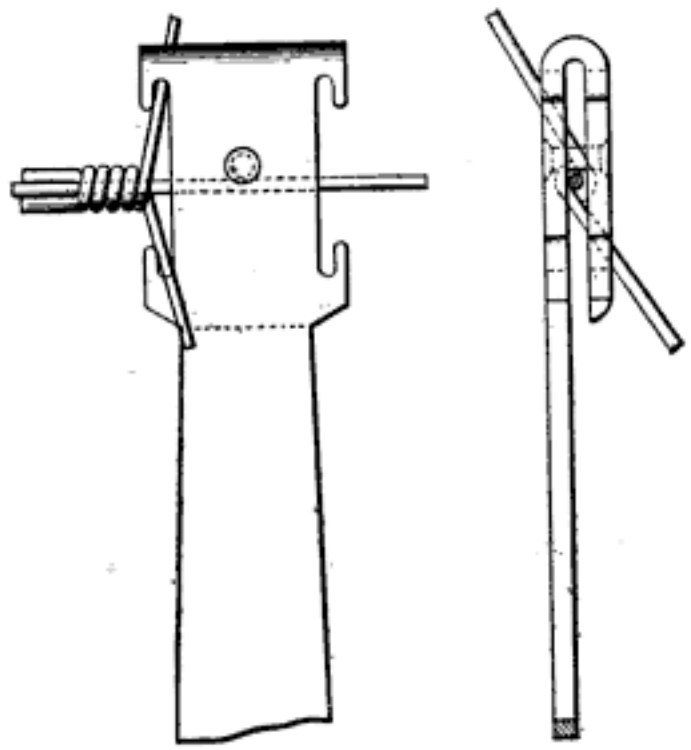
Engineers troubled with noisy dash-pots may profit by a kink practiced by a correspondent of Power, who says the dash-pots on an engine he was operating always slammed when brought home.

To prevent this he put a valve on the end of each of the pipes which are about 2 ft. long. He now leaves the regulating valves on the dash-pots open, and regulates by means of the valves in the pipes. The plungers are brought home as quickly as before and there is more air to act as a cushion and prevent the sound.

The same writer says that when an engine that is equipped with dash-pots of the leather-packed type is running and a dash-pot gets to bucking and water will not help it, it can be temporarily repaired by putting a check valve on the end of the pipe; this can be done without shutting down.

A HANDY WIRE-SPLICING TOOL

The illustration shows a wire splicing tool which will be found useful. The device is used in making a three-wire connection.—Contributed by W. H. Cunard, Everett, Pa.

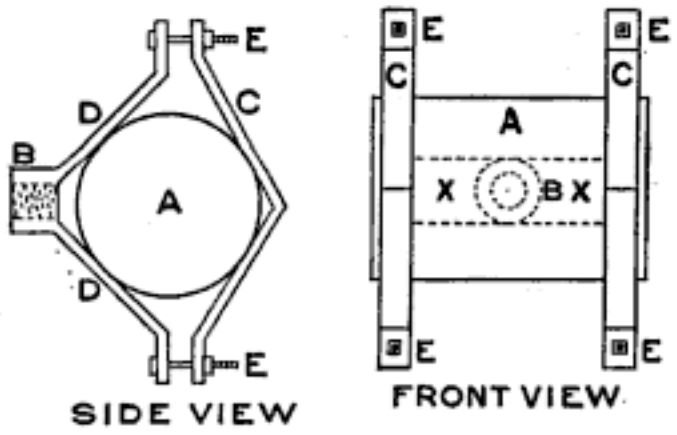


Three-Wire Splice

JIG FOR BORING WRIST-PIN HOLE IN GASOLINE PISTON

The parts of this jig or fixture are as follows: B is a boss threaded to fit the lathe nose; DD are cast on to the ends of X; CC are clamps secured by bolts EE.

In using, the fixture is screwed on the lathe spindle, when the trunk piston, A, may be very easily set in position for boring the wrist-pin hole. Many sizes of pistons may be machined by the use of one of these jigs, and when well made, they produce very accurate work.—Contributed by E. M. Davids, Los Angeles, Cal.



USEFUL ARTICLES MADE OF WROUGHT-IRON PIPE

Pipe and fittings can often be used to advantage by the tradesman in constructing articles needed about his work which must be both light and strong, says the Metal Worker. Nearly every workman can construct these various articles according to his individual requirements and perhaps improve upon them. Those shown here are in the nature of suggestions of the adaptability of the material.

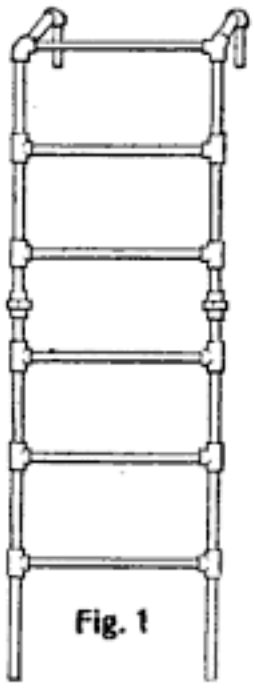


Fig. 1

A short ladder made of ¾-in. iron pipe, connected by T's, elbows and unions is shown in Fig. 1. The ladder is so constructed that it can readily be taken through small places, as to inspect tanks in attics, or conveying in a vehicle, such as an open buggy, the unions being placed in the middle. It has

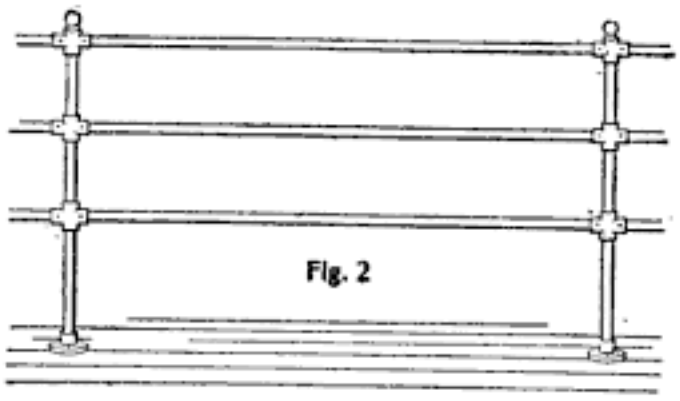


Fig. 2

hooks on the top so that it may be hooked over the side of a tank.

The railing shown in Fig. 2 is made of 1¼-in. pipe. Special railing fittings are used in screwing up the vertical posts with

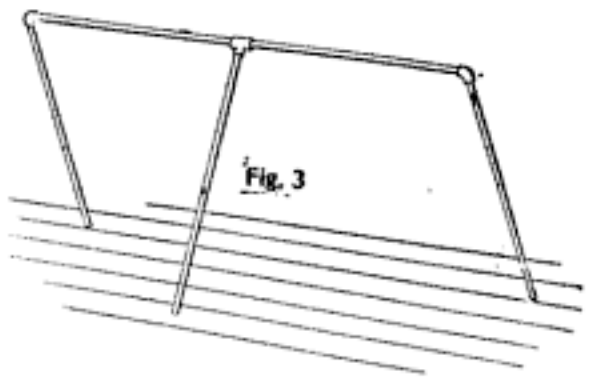


Fig. 3

threads and the side rods are connected by rivets. A post is held to the floor by one-half of a flange union and an ornamental cap surmounts the top of each post. The railing is both substantial and neat and may be changed and adapted to almost any requirement.

Five pieces of ½-in. pipe, two elbows and a T were used to make the horse for a drafting table shown at Fig. 3. The device is light and adjustment is made by moving the middle leg backward or forward. It may be taken apart and set up at another point, if desired at any time.

HOW TO TELL STEEL PIPE FROM IRON PIPE

It is so often difficult for users of pipe to distinguish iron pipe from steel that a few hints on the subject may be found helpful. The scale on steel pipe is very light and has the appearance of small blisters or bubbles; the surface underneath being smooth and rather white; on iron pipe the scale is heavy and rough. Steel pipe seldom breaks when flattened, but when it does break the grain is very fine; whereas the fiber of iron is long and when the pipe breaks, as it readily does in the flattening test, the fracture is rough. Steel pipe is soft and tough, says Domestic Engineering, and when it is threaded, the threads do not break, but tear off. It requires very sharp dies to cut the threads on steel pipe successfully, and a blunt die which might be used with satisfactory results on iron pipe, will tear the threads on steel pipe, because of the softness of the metal.

DETERIORATION IN GRATES

The principal cause which contributes to the rapid burning out of the grate bars in a boiler is the action of the furnace heat, which will in time destroy any set of grates, but the want of a proper flow of air through the grates will cause overheating whether it occurs through too little air-space in the grates themselves, or by these spaces becoming obstructed through any cause, thus preventing the cooling effect of the air on its passage to the fire. Another reason is found in the impurities of the coal, and especially in the chemical combinations of sulphur and iron, which impurities are found in more or less quantity in all coals. The Practical Engineer says any coal which forms an easily fused clinker will injuriously affect the grates.

HOW TO REMOVE GALVANIZED COATING

The coating should be burned off, and if the galvanized parts are to be welded, the heat for welding can be obtained at the same time. Heat the pipe or iron to a white heat and use only plain, clean sand. After preparing one end for welding, says a correspondent of the American Blacksmith, plug the opposite end so as not to burn the pipe.

HOW TO MAKE A PORTABLE SCAFFOLD BRACKET

A pair of portable scaffold brackets which can easily be stored out of the way will be found a great convenience by the tradesman who only needs them occasionally and usually borrows them at such times of a carpenter. The bracket shown

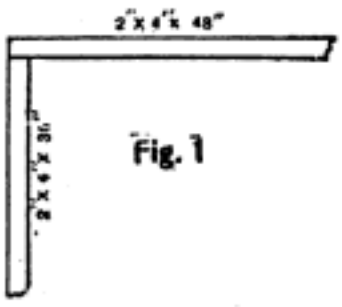


Fig. 1

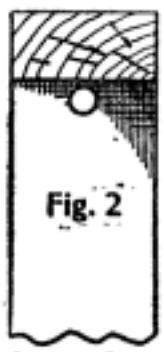


Fig. 2

in the sketches takes but a few hours' work to construct and may be readily set up on the work, says the Metal Worker.

To make the bracket use a 2x4 stick 36 in. long for the upright, and for the bracket a 2x4 stick 48 in. long. Place the longer piece on top of the shorter, as in Fig. 1, and spike them together with two 20-penny nails, driving the nails in as near

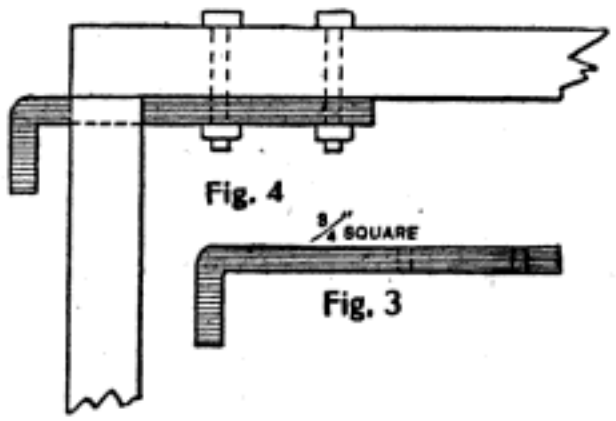


Fig. 4

Fig. 3

the outside as possible. Bore a ⅞-in. hole in the short piece, directly under the top piece, as in Fig. 2, and pass an iron hook, Fig. 3, through the hole. The hook should be made of ¾-in. bar iron, 9 in. long and drilled for two ⅜-in. bolts. Make the hook part 2 in. long and bolt it directly to the top bracket, as shown in Fig. 4, allowing the hook part to extend about an inch from the back. With 10-penny nails attach 1x6-in. diagonal pieces near both ends of the

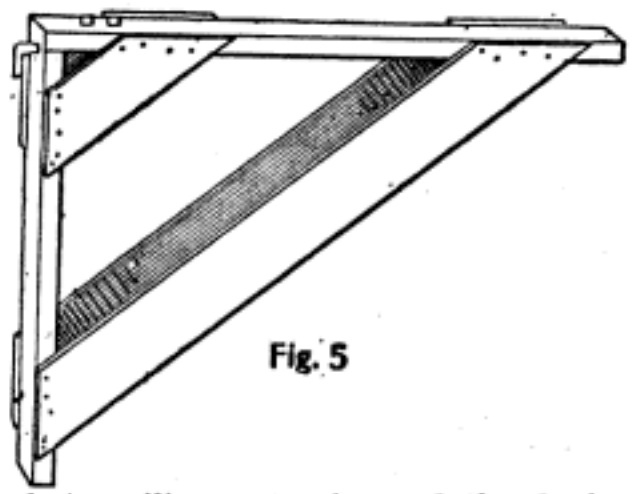


Fig. 5

bracket, nailing securely, and the device is then complete, as in Fig. 5.

In fastening the bracket on a building, cut a hole 1 in. wide and 3 in. high into the sheathing close to the stud. The bracket can be unhooked easily from this position. The device will be found both cheap and light and also a time-saver.

KEEP OIL OUT OF BOILERS AND FEED WATER HEATERS

Many boiler experts insist that oil or grease inside a boiler or heating surface is far worse than the ordinary scale deposited from the water, in cutting off heat from the water and overheating the boiler plate.

Tests have been made to show this, says a writer in Page's Weekly. When the temperature of the water was made to rise rapidly in a clean boiler, the difference in temperature between the boiler plate and the water did not increase at the same rate, showing that the heat passed through the water nearly as fast as received. With a very high evaporation of steam per hour in a clean boiler there was little danger of overheating the metal. But covering the inner surface of the metal with a thin layer of heavy mineral oil and evaporating about as much steam as in the first place, the fire side of the boiler plate was 392° hotter than the water side. The plate itself must have stood a temperature of about 630° F., at which iron and mild steel weaken and are easily broken. Any flaw in the plate would of course add to the danger.

Hence for safety and economy, when exhaust steam is mixed with the feed water, use feed water heaters in which the steam is on one side of the tubes and the water to be heated on the other, if possible.

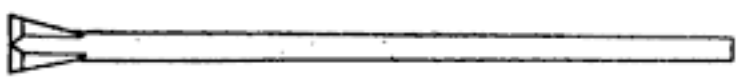
DRILLS SHARPENED BY POWER MACHINES

Cost of Sharpening Greatly Reduced--No Longer Necessary to Upset a Half-Foot of Stock.

The sharpening of drills by machine is rapidly superseding the old practice of sharpening by hand, not merely because it is easier, but because of the great economy thereby effected. Various methods of sharpening were formerly in use in mines, says T. H. Proske, in the Mining and Scientific Press, and all were laborious and expensive. Usually the cross bit, which took the place of the single bit in the modern air drill from the first, was upset to twice its normal size for from 6 to 8 in. at one end in order to

Type of drill used in Rocky mountain mining districts. Cross-formed bar welded onto octagon bar; shank forged to small bushing.

Type of drill used in Michigan copper and iron mines. Long cross upset in bolt upsetting machine from octagon bar.



Type of drill as made with a Power Drill Sharpener. Cross upset 3 inches long from round bar; no forging down of shank, as chuck bushing is large enough to take the full size of bar; the most economical drill that can be made.

have a long stock to use in redressing the bit. When this upset portion was worked down, the bar was again upset.

In some Michigan mines a bolt-upsetting machine was installed to do this upsetting, but the expense was prohibitive of this practice becoming general. Then steel-makers began to manufacture cross-formed bars of steel which were cut into the required lengths to be welded in the bars. This practice is general in Rocky mountain mining districts, and while somewhat cheaper, is still expensive.

Until the advent of power drill sharpening machines it is said that no two mines used the same kind of drill. There was no economy in the gauge used. Often the starter drill would be 3½ in. wide and drop ¼ in. in gauge for each successive length. Out of this chaos the machine method brought system. It was determined that for 1¼ in. powder, a 1 7-16 in. hole at the bottom is sufficiently large; that the strength of the powder can be increased more cheaply than the size of the hole, and that the gauge should not vary more than ⅛ in. Supposing a 9-ft. hole were to be put down with four lengths of drills, the sizes would be as follows: Starter, 1¾ in. wide; successive lengths, 1⅝ in., 1½ in., and 1⅜ in. wide, respectively.

A 3-in. cross is sufficient where the machine is used and the sharpener will forge the cross and bit on the end of the bar without hand labor. One man using such a machine can sharpen from 200 to 300 per cent more drills than he can sharpen by hand.

SOME GOOD RECIPES FOR CEMENT FOR LEATHER BELTS

(1) Soften equal parts of good hide glue and American isinglass in water for 10 hours. Then boil it with pure tannin until the mass is sticky. Roughen the surface of the belt joints and apply the cement hot.

(2) Digest 1 kg. of finely shredded gutta percha over a water bath with 10 kg. benzol until thoroughly dissolved, then stir in 2 kg. of linseed oil varnish.

(3) Dissolve completely 1½ kg. finely shredded india rubber in 10 kg. of carbon bisulphide by heating and while still hot add 1 kg. shellac and 1 kg. turpentine. Heat again until the last two ingredients are dissolved.

(4) Dissolve at a moderate heat 1 kg. best glue in 1½ kg. of water and thicken to the consistency of syrup. While this mass is hot stir in 100 gm. of thick turpentine and 5 gr. carbolic acid. Pour the mixture into flat tin pans to cool; cut it into pieces and dry it in the air. To use, make the cement liquid with a little vinegar, apply to the joint with a brush; place the two ends of the joint together and press between two iron plates heated to a temperature of 86° F.

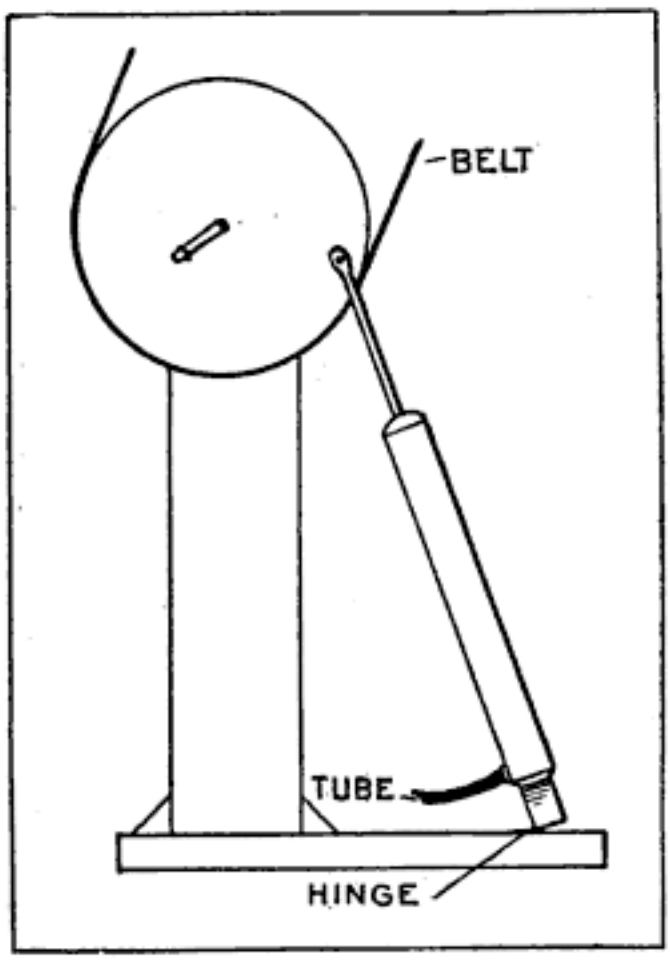
PAINTED PAPER FOR STEEL

Steel surfaces may be protected with excellent results by covering them with painted paper. The method employed is to first clean the steel in the ordinary way and then put on a single coat of a very sticky substance, upon which paraffined paper is next laid. Any color paint desired may be used for painting over the paper. Holes cut in the paper allow the rivet heads to pass through and the heads are then covered with caps of the paper and painted also.

HOW TO MAKE A SMALL AIR COMPRESSOR

Anyone possessing, or able to obtain an old bicycle pump can, without much difficulty, make a small air compressor which will pump a bicycle tire or run a toy steam engine. The next thing necessary is a pulley about 8 or 9 in. in diameter and 2 in. thick.

Mount this pulley on a piece of ¼- or ½-in. steel rod for a shaft. Bend about 2 in. of one end of the shaft at a right angle and force the rod through a hole in the center



Air Compressor Made of a Bicycle Pump.

of the pulley, hammer it into the wood and fasten it with a staple.

Remove the handle from the bicycle pump, heat the end of the piston rod to a bright glow and hammer it flat. Drill a hole in the flat part large enough for a nail to pass through easily. To the foot-piece on the bottom of the pump solder a hinge and then screw the loose part of the hinge to the baseboard which is constructed as shown in the illustration.

In putting the compressor together mount the shaft of the pulley on pieces of sheet brass having holes drilled to make an easy fit. These pieces of sheet brass should be screwed fast in a hole in one end of a 2 x 4 in. timber 2 ft. long. Nail the end of the piston rod, through the hole drilled, to the pulley and belt whatever means of generating power you may have to the air compressor which is now complete. A small electric motor will work the apparatus nicely for pumping bicycle tires or other work of that nature.—Contributed by E. H. Klipstein, East Orange, New Jersey.

CASTING ALUMINUM FOR PATTERN WORK

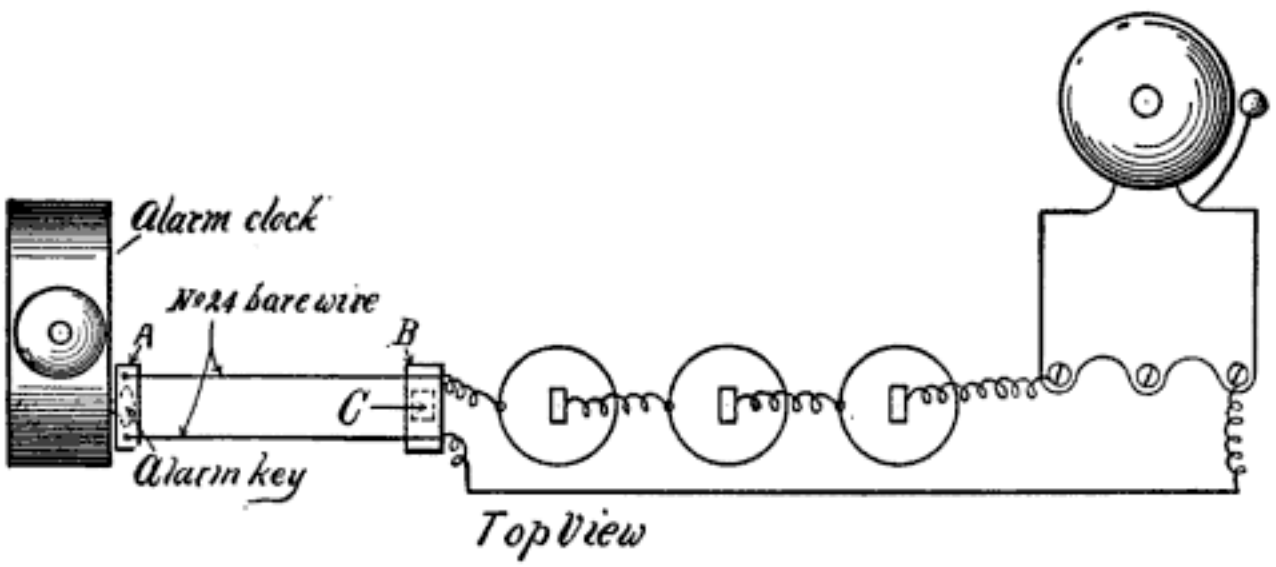
Casting aluminum for pattern work is a matter that is constantly assuming greater importance, says the Mechanical World, and there is a demand for general information on the subject. It is important to make the mould suited to the casting. For instance, a plain bar can be molded up as hard as may be, and if well vented, will come out perfect. On the other hand, a thin ring, unless molded up soft enough to allow the metal to compress it, will be sure to tear apart. Hence, wherever the metal is to inclose the sand, this must be left as soft as possible, to allow for compression during the cooling of the casting. Ram the sand as little as possible, use as dry as possible, vent freely, and you are pretty safe. Aluminum is quite brittle at the critical temperature, hence the least strain at that time injures it. Cores should be soft, and coated with graphite. The sand should be new, and while no facing is necessary, a good dusting with soapstone can be recommended. The slicking tool should never be used on a mold.

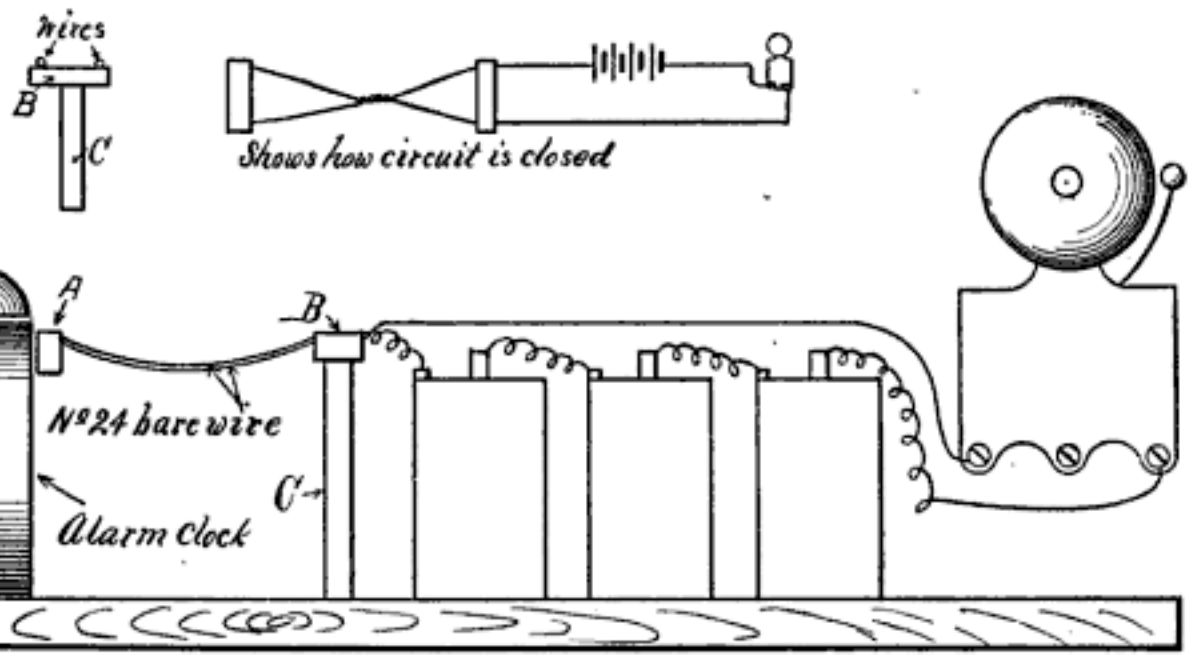
Melt the aluminum in a plumbago crucible, previously rubbed up with graphite. When the metal is melted, it should be poured at once. Gates should be wide, and of a generous area. Big feeder heads are not advisable, as they do not feed, but rather draw away the metal from the casting. The metal should not be too hot, a good claret color is sufficient, when observed by putting aside the skin with a stick. Fluxes are unnecessary; occasionally, however, cryolite may be used to advantage. All sodium salts should be kept away. Zinc can be added, though the metal should not be sold as an aluminum casting. Up to 15 per cent can be used safely. Tin also should not be added to the aluminum.

Bristles may be stiffened by immersing them in cold alum water for a short time.

HOW TO MAKE AN ELECTRIC ALARM ATTACHMENT FOR AN ALARM CLOCK

Make a baseboard for this device about 10 in. long by 6 in. wide at the center, with an upright C, extending upward to about the height of the alarm key of the clock. the two bare wires together forming a circuit which will set the electric bell ringing. The wires will untwist when the alarm is again wound up, and the electric bell will





Side View

On top of the upright fasten a small piece of wood to form a T, and fasten a similar piece on the alarm key, as at A in the sketch. Connect these two pieces A and B with two pieces of No. 24 bare copper wire and carry the wires on to form connections, one going through the batteries to one terminal of the bell, and the other passing directly to the other terminal.

The apparatus will then be in working order. Set the alarm in the usual way. When it goes off, the turning key will twist ring until this operation is performed.—Contributed by W. J. Slattery, Emsworth, Pa.

CEMENT FOR STEAM PIPES

Rub as fine as possible, litharge, 2 parts; powdered slaked lime, 2 parts; sand, 1 part. Mix the mass with a sufficient quantity of hot linseed-oil varnish to form a stiff paste. Use the cement while fresh and warm.—Contributed by R. Lindemann, Boulder, Colo.

HOW TO FILTER WATER FROM GASOLINE

Fine wire gauze will not remove water, but if a chamois skin pocket be carried by a gauze on either side and placed between the gasoline tank and the carburetter, all dirt and water will be removed, says the Motor

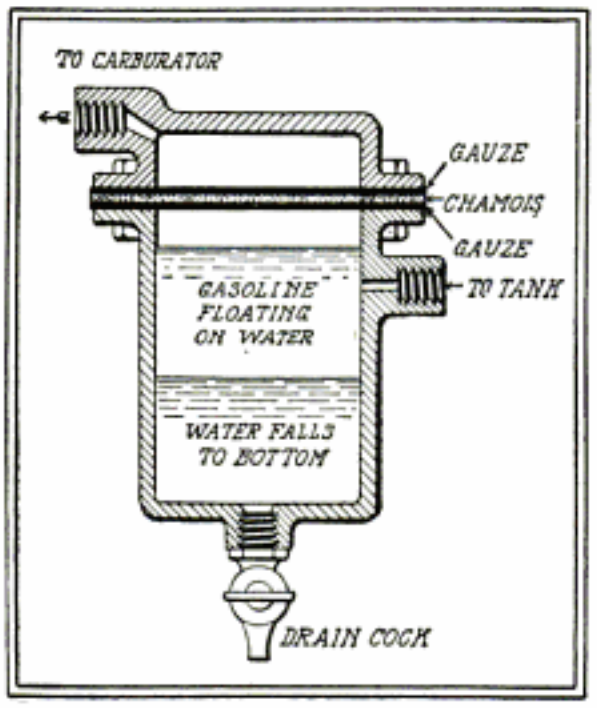


Fig. 1.

Age. The arrangement should be on the order of the device shown in Fig. 1, so that the water may settle into a separator, and be drained off. The separator should be about 4 in. long and 2 in. in diameter. If this is drained each day no water will reach the carburetter unless the chamber becomes filled, which could only be occasioned by rain entering the fuel tank as the gasoline itself of a day's usage would not contain that quantity. The strainer placed between the tank and the carburetter is better than one placed at the tank, for the reason that in the latter dirt and water would be forced through the tank strainers by the impact and weight of the fuel entering, while in a strainer placed between the tank and the carburetter the fuel is strained slowly, in fact as slowly as it is used. A first-class water separating strainer is shown in Fig. 2. At the bottom of the separating chamber is a needle valve. On this valve is a metallic float of such a weight as to sink in gasoline and just float in water. When the chamber is filled with gasoline the valve is seated, but as soon as water collects the float is lifted, opening the valve and letting the water flow out until the gasoline comes to such a level that the valve seats. The device has the gauze and chamois strainer.

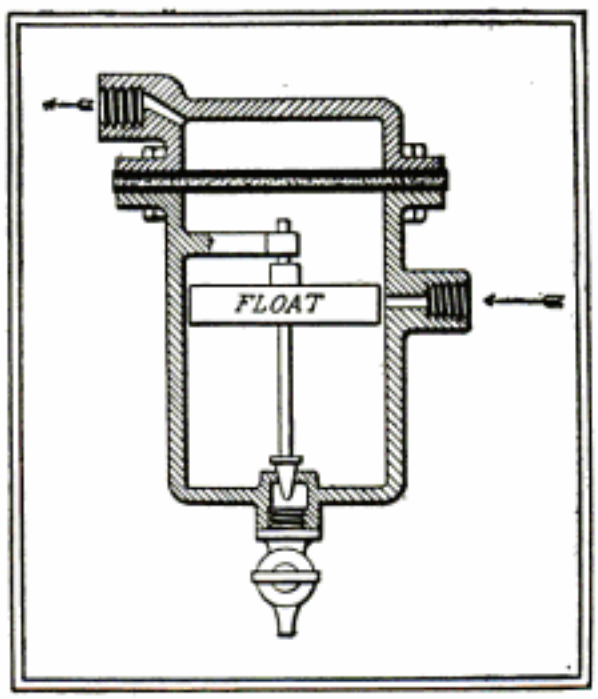
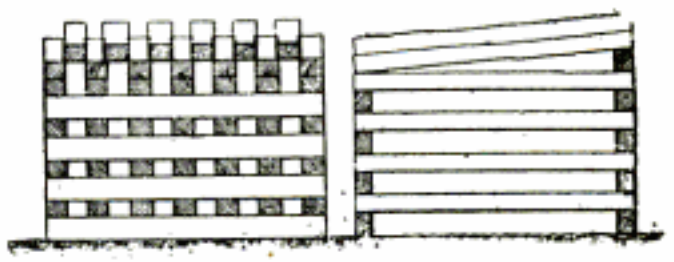


Fig. 2.

HOW TO PILE RAILROAD TIES

The proper method of piling railroad ties is shown in the accompanying illustration. Each pile contains either 25 or 50 ties built up in alternate courses of two and seven.



The Way to Pile Railroad Ties

Two ties are first laid on the ground some distance apart, then seven others are placed across these and so on to the top, where the last course is laid to form a watershed.

HEAT-RESISTING CEMENTS

1. For cementing joints. Make into a thick paste, asbestos powder and liquid silicate of soda. This cement will withstand a very high temperature.

2. For stoves and ranges. Use fire clay and a solution of silicate of soda.

3. The following cement will resist white heat: Pulverized clay, 4 parts; plumbago, 2 parts; iron filings, free from oxide, 2 parts; peroxide of manganese, 1 part; borax, ½ part; sea-salt, ½ part; mix with water to a thick paste and use immediately. Heat gradually till it comes nearly to a white heat. This cement is recommended by the Monumental News.

HOW TO PAINT CEMENT FLOORS

In order to roughen the surface of the floor so that the paint will hold on well and also to change any caustic lime contained in the cement into harmless sulphate of lime, the floor should first be treated with a wash. If it is only a few months old, a wash consisting of 12 fluid ounces of vitriol and one gallon of water mixed in an earthen or glass vessel, allowed to cool, and then applied with a large fiber brush or a swab made of cotton waste, will produce the desired results.

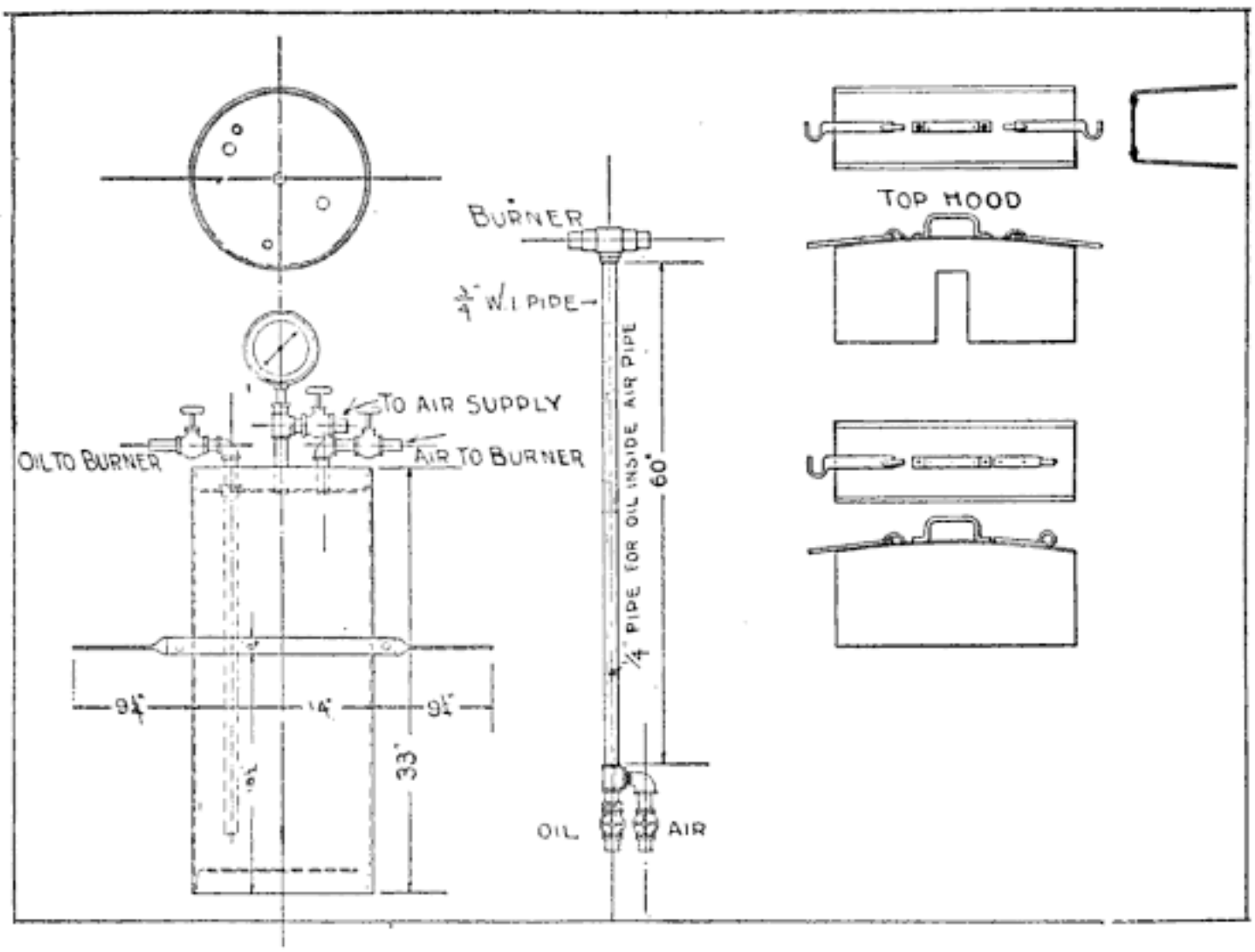
After the wash has been on 24 hours apply a priming of well-settled and well-aged raw linseed oil and let stand for a week. Then apply a coat of good linseed oil paint, preferably with a pure lead and zinc base. Rub in well and finish with a hard drying floor paint of the grade used on ferry boats, says the Painters' Magazine, and adds:

"If such a floor paint is to be of lead color or spruce color, it is best made on a base of equal parts of lead and zinc in oil, thinned with equal parts of turpentine and japan to brushing consistency, tinted to suit requirements, and then mixed equal parts by measure with hard drying floor varnish of approved quality."

On cement floors thus treated the paint will wear well even in engine rooms and machine shops where oil is apt to be spilled over it.

HEATING TIRES WITH CRUDE OIL

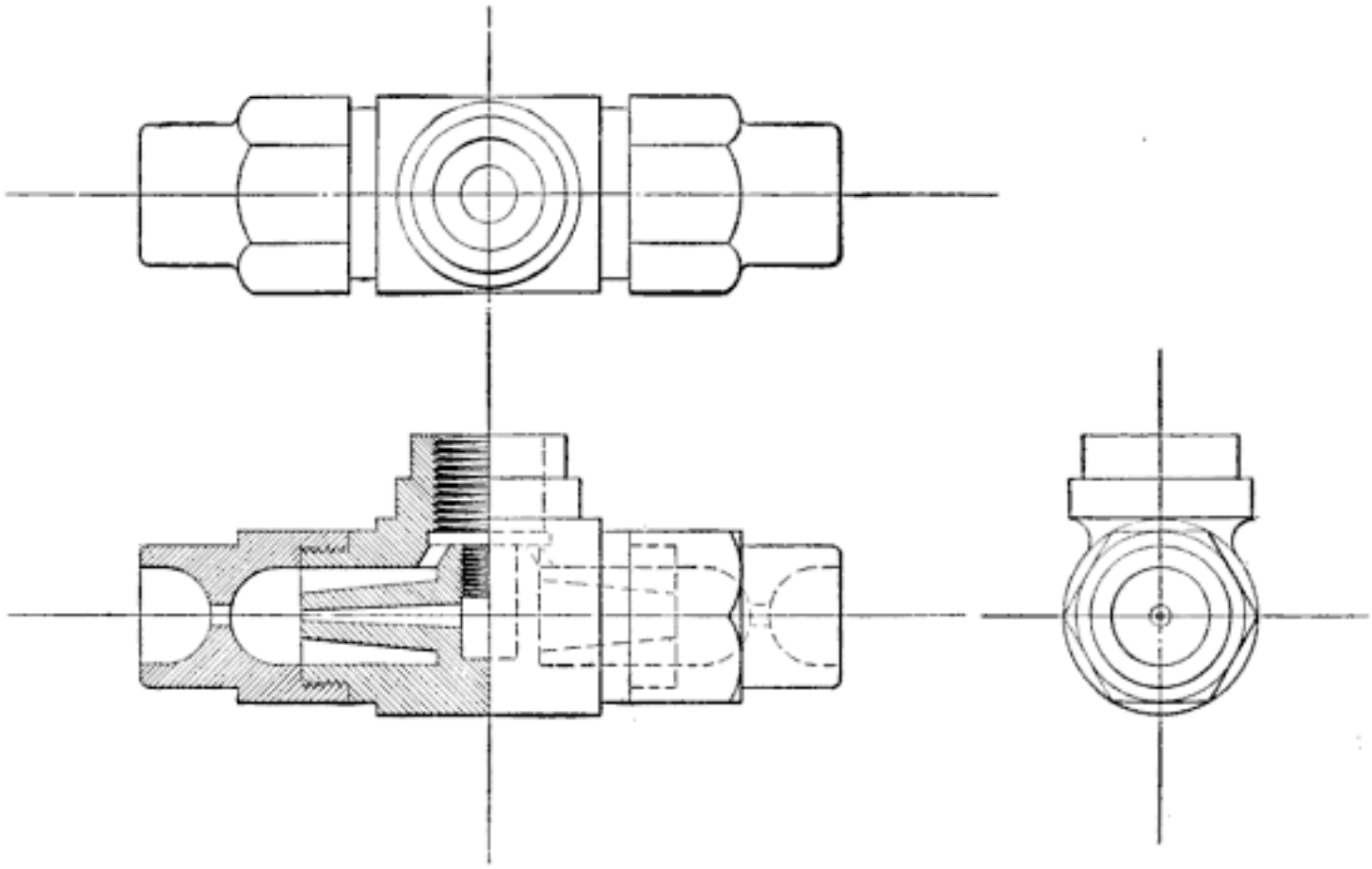
The illustration shows an apparatus used for heating locomotive tires with crude oil as a fuel. With this process it takes only about six minutes to heat one tire, about two gallons of oil being used.



Heating Locomotive Tires With Crude Oil

The method of using the apparatus is very simple. If a tire is to be heated, the wheel is jacked up for several inches off the ground, then the sheet metal hoods are placed all the way around the tire, leaving but a small space at the bottom for the burner to be inserted. A piece of lighted waste is then placed directly in front of the burner and the oil and air turned on, the amount of each being determined by the operator.

The construction of this device is both cheap and simple. For the oil tank an old air-drum off a locomotive may be used.



Detail of Oil Burner for Heating Tires

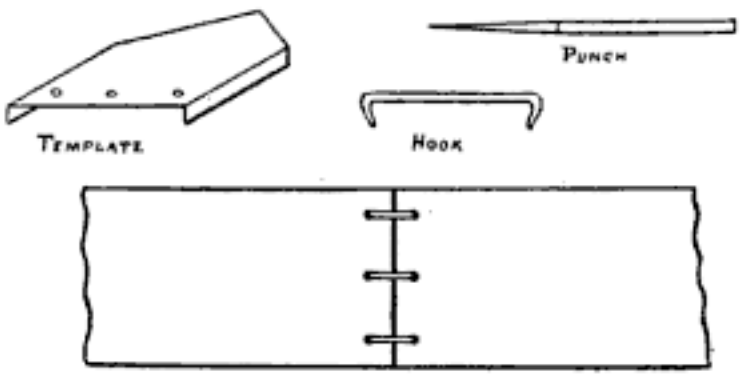
The burner is connected to the tank by two hose pipes each about 30 ft. long. Only about 60 to 80 lb. air pressure is required to operate the burner.

This tire heater is in use in several railroad shops about the country and has proved very satisfactory as a quick and cheap method of removing and setting tires. —Contributed by G. E. Baldwin, 624 D St., San Bernardino, Cal.

HOW TO MAKE A CANVAS BELT JOINT

In rooms where there is so much dampness and steam that rubber belts are affected thereby and come off, canvas belts can be substituted and will be found to work very well, says the Practical Engineer.

These belts may be mended in the following manner: Place a tin template, having holes the right distance from the sides and ends, on the end of the belt, square it off, mark the holes and punch them with a long pin having a tapered point. This pin is better than a belt punch, as the punch cuts away and weakens the belt and the hook will pull out. Use a hook with a good, and quick point. It is a good idea to keep templates for different-sized belts on hand. The wide ones should have more holes.



Making a Canvas Belt Joint

SUBSTITUTE FOR PURPLE LAKE

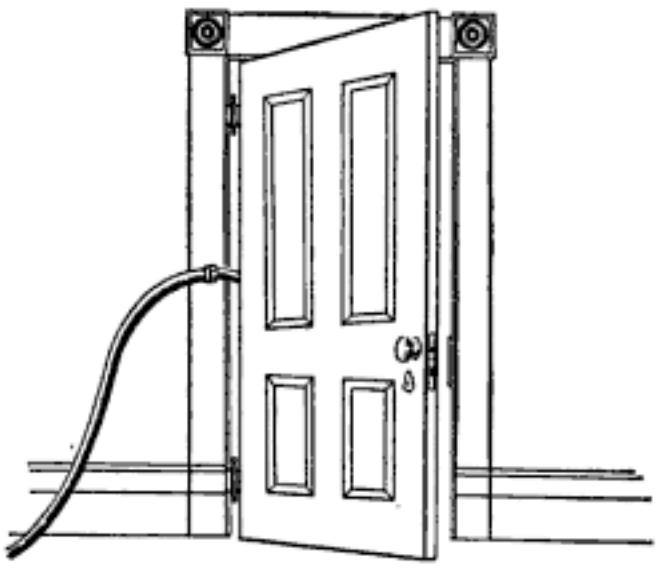
Purple paint is so rarely used that it does not pay the average painter to buy a can of purple lake when he needs but a little. If he will add just a touch of ultramarine or cobalt to his carmine and glaze as for carmine, or, add a touch of Prussian blue to the ground and glaze with clear carmine, the results will be satisfactory.—From John L. Whiting & Son's Book, "What Else to Do."

The amount of Portland cement used in this country doubles about once in four years. Last year it amounted to more than 23,000,000 bbls.

MADE A VISE OF A DOOR

When a vise is not handy, and one is not strong enough to hold the work with his hands, the following kink may be found useful:

A gardener who was repairing a lot of old hose and whose only suitable tool was a



Utilizing the Door as a Vise

wrench, could not get the old couplings apart. He asked me to hold it for him, but I could not. Instead, I opened the barn door and through the crack between the door and the side of the casement on which it was hung pushed a piece of hose up to the coupling. Then pushed the door to, and while the gardener held it, I unscrewed the nut by means of the wrench. There are many articles that could be held in this manner.—Contributed by Thiede of Colorado.

HOME-MADE CROSSHEAD PIN OILER

A very satisfactory crosshead pin oiler may be made like the one shown in the illustration. A correspondent of the National Engineer says he applied such an one to a vertical engine several years ago and it is still doing good work.

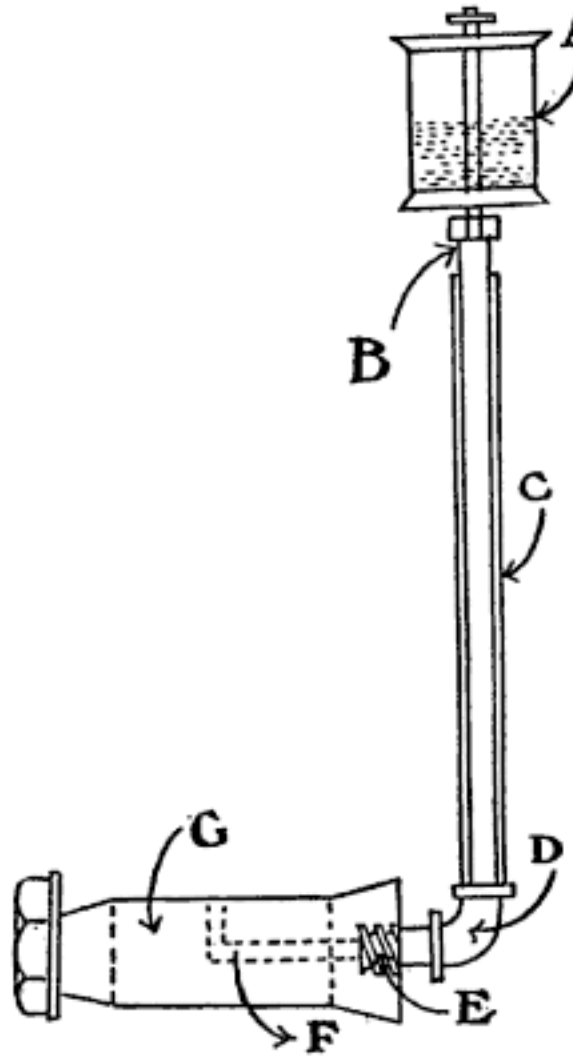
The device consists of an oil cup, A; a piece of ⅛-in. pipe, B; a piece of ⅜-in. pipe, C; and a ⅜-in, elbow and nipple D. The outer end (E) of the pin is tapped with a ⅜-in. pipe thread, and the oil duct is drilled as shown at F.

The cup is stationary and is fastened to the front of the cylinder or engine frame by a bracket over the center of the elbow D. The shank of the cup is drilled and tapped for ⅛-in. pipe, into which is screwed the pipe B, which telescopes the ⅜-in. pipe C.

To determine the height at which to place the cup, place the engine on upper center (vertical engine) and place the end of shank of cup the length of the engine stroke, plus at least 2 in. above the face of elbow D.

To determine the length of the ⅛-in. pipe, place engine on upper center and cut pipe long enough to reach within ½-in. of shank of cup, when screwed into elbow D. The center of the elbow D must be plumb under the center of the cup A, thereby allowing pipe C to travel up and down outside of pipe B without touching it at any point.

Only one oilway should be cut in the top



Home-Made Crosshead Pin Oiler

crosshead pin brass and it should extend lengthwise to within an eighth of an inch of each end. Always have the oil duct at the top of the pin, and always be careful not to turn the pin while tightening the nut, if there is no means provided for holding it in position.

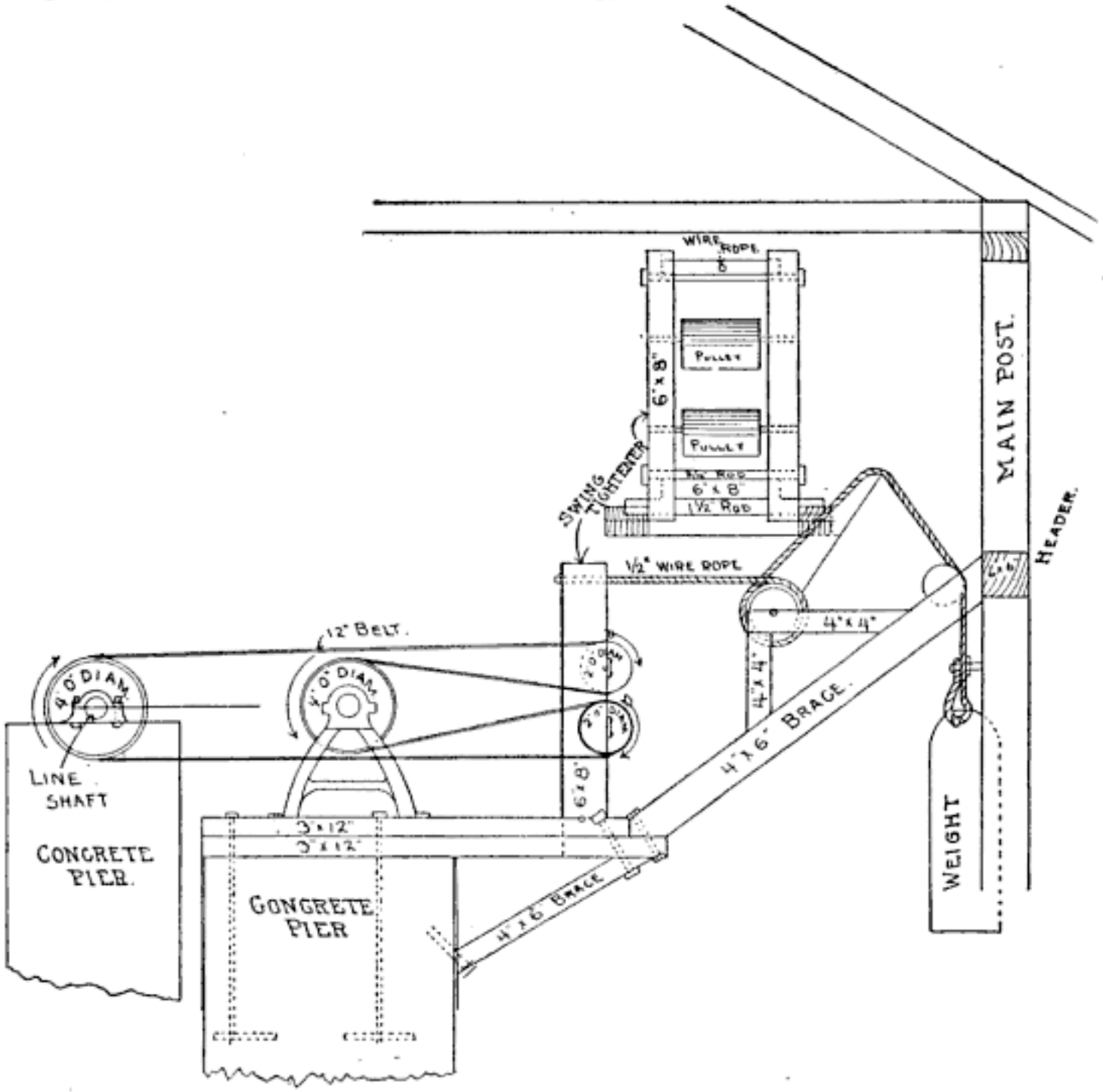
Castor oil is an excellent preservative for leather belts and rats will never touch belts treated with it. Apply the oil warm.

A POWER TRANSMISSION KINK

The accompanying diagram is a plan submitted by C. J. Case, of Johnsonburg, Pa., showing how he succeeded in running a machine requiring 40 hp. in the opposite direction from the line shaft, without crossing the belting. The back of the belt runs on the driven pulley. The speed maintained was 193 r. p. m. The direction in which each pulley revolved is indicated by arrows.

WRITING DETAILS ON BLUEPRINTS

A solution of 75 gr. of potassium oxalate dissolved in one ounce of water is excellent for writing details on blueprints. The fluid should be applied with a pen or fine brush, and may be thickened with gum, if necessary. It removes the blue ground of the drawing very rapidly, but the paper should be washed well afterwards or the blue will reappear, and the writing become obscured.



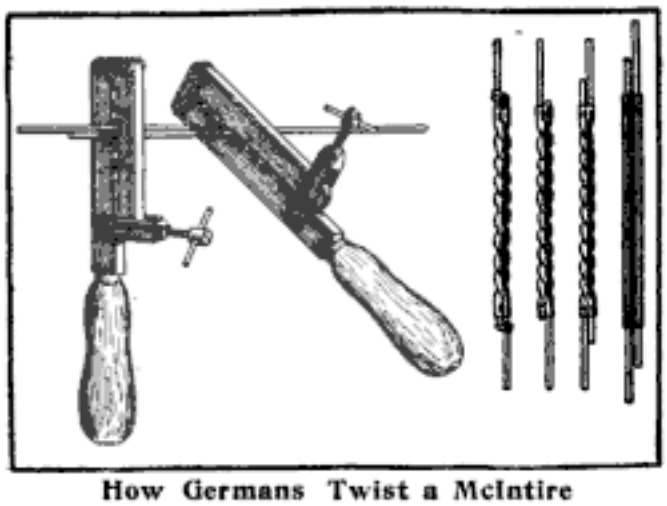
Running a Machine the Opposite from Line Shaft Without Crossing the Belt

TO EMPTY GASOLINE FROM BARRELS

The best method is to syphon the gasoline out with a rubber hose. says a correspondent of the Engineers' Review. To start the flow of the gasoline, pass a string a few inches longer than the hose through the hose by means of a plummet tied to one end. To the other end tie a bunch of rags. Push these into the end of the hose, poke the hose rag end first into the barrel to its lowest point, hold the hose in place with one hand and pull on the string with the other. When the rags come out, the gasoline will follow.

TWISTING A "McINTIRE JOINT" IN GERMANY

American linemen use only a pair of pocket pliers for twisting up a McIntire joint, says the American Telephone Journal, but in Germany the linemen have a pair of clamps especially for the purpose. These



How Germans Twist a McIntire

clamps resemble nut crackers somewhat, but have a number of slots fitting the different sizes of McIntire joints it may be necessary to make. Each clamp has a handle and a set screw by means of which its jaws are fastened about the sleeve to be twisted. With the sleeve in position and the two clamps applied the joint is made by revolving the handles in opposite directions.

AN EMERGENCY WATER FEED

The shop was away out in the woods; the boiler an upright and the engine a 5x12-in. The injector went all to pieces one afternoon and they had no pump. Most people would have shut down and waited till a new injector could be telegraphed for and received. This is what the engineer did. There was a piece of five-inch gaspipe under the bench; it happened to be about three feet long and threaded at each end. Caps were screwed on and one end connected by way of a one-inch pipe to the feed-pipe. This one-inch pipe was long enough to raise the five-inch length above the top of the boiler. The upper end was provided with a short length of one-inch pipe provided with a globe valve and ending in a funnel. This end was also connected with the steam space by a half-inch pipe running into the hole lately occupied by the third water-gauge cock. The shop started at seven the next morning and for four days that boiler was fed by gravity. The valve in the steam pipe and in the one-inch pipe below the five-inch piece would be closed; the big pipe filled through the funnel; its valve would then be shut, the others opened and down would go the water into the boiler. Of course it made hard work lugging water up a ladder in pails all day, but the engine kept turning.

GLUES FOR RESISTING DAMP

1. Prepare ordinary glue with boiled linseed oil.

2. Melt 1 lb. glue in 2 qt. skimmed milk; shellac, 4 oz.; borax, 1 oz. Boil in a little water and concentrate to a paste by heat.

TO MAKE PAINT ADHERE TO GALVANIZED IRON

In painting galvanized iron apply first a solution of ammonia water, using a whitewash brush to put it on with. Allow this to dry before applying the paint, says a correspondent of the Metal Worker, and there will be no difficulty about the paint adhering to the iron.

HOW TO MAKE A HOE FOR THE FIRE-ROOM

A hoe much better adapted to the dimensions of the boiler and the kind of fire carried can be made at home rather than bought, says Power. To make such a hoe, rivet a ¾-in. malleable railing flange on to a piece of iron, 3-16x6½x13 in. Screw in a

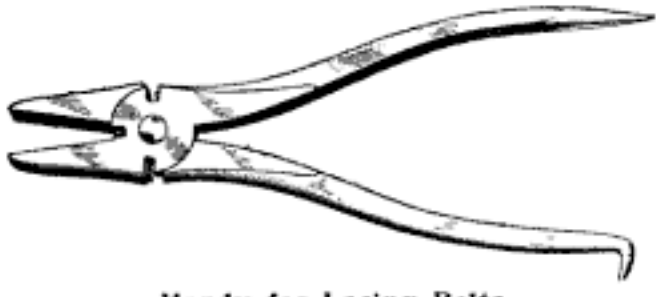
Hoe for Fire-Room

piece of pipe of the proper length, and fit the other end of the pipe with a piece of iron bent as shown in the illustration. This can be put on by means of a reducing coupling.

A machine for keeping the smoke tubes of marine or stationary boilers free of soot has recently been invented. Hitherto the tubes have been swept out about every seven days; by means of the new device the retarders in the tubes which break up gases on their way through the tubes are rotated by a handle on the outside. The operation is so simple that it can be performed every few hours, giving an economical result in the coal consumption.

TOOL FOR USE IN LACING BELTING

A very handy tool for use in lacing belting consists of a pair of ordinary pliers having one end made into a hook for use in taking out old belts, which is usually very difficult, and the other sharpened to a point like an awl, so that, should the holes in the new belting be a trifle too small they can be punched to suit. The pliers are used to grab the lace when it is started. In stretching bolting silk or any cloth, the pliers, having the nose ground thin, are very handy for holding the cloth while tacking or nailing.



Handy for Lacing Belts

The pliers may be used also for cutting wires, or cutting wire nails shorter when the right size is not on hand.—Contributed by J. F. Gunsolley, Independence, Mo.

A GOOD METHOD OF REPAIRING RUBBER ARTICLES

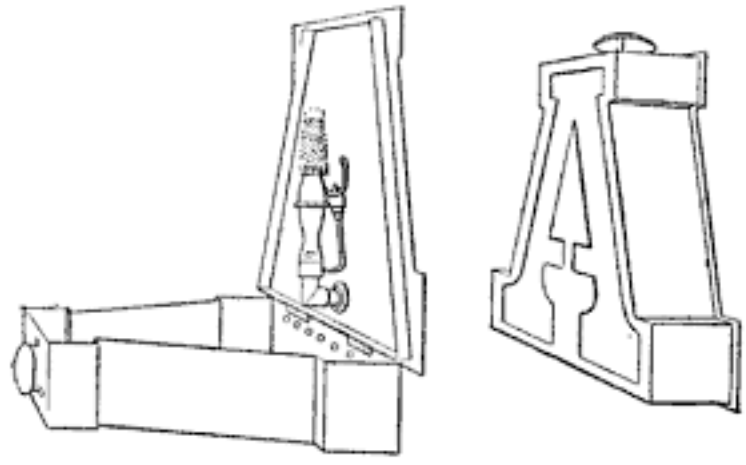
Cut up into tiny bits a 1½-in. square piece of red rubber, put it into a bottle, pour a teaspoonful of chloroform on it, and cork it up tightly. Let stand for ten minutes, when it will be melted sufficiently for use.

Cut a piece of rubber dam considerably larger than the place to be mended, and if the hole is large take a few stitches in it. Wet the impaired article with chloroform and as quickly as possible apply a layer of the melted rubber over as large a surface as the piece of dam you have cut. Use a small stick for applying the melted rubber. Wet the dam with chloroform and stick it on. If the hole is very bad, a second piece of the dam and more of the melted rubber may be used. Five cents' worth each of the red rubber and the dam will suffice and the remainder of the melted rubber may be used again by adding chloroform.

The little kink that saves you trouble and labor every day or week would help the other mechanic, too, if he but knew it. Send us a rough sketch and brief description. This department is for men of every craft, and that includes you.

GASLIGHT FLASH SIGNS FOR SHOW WINDOWS

Flash signs for show windows using gas instead of electricity may be fitted up so satisfactorily that the effect produced is quite the equal of that produced by the electric flash sign, says a correspondent of the Acetylene Journal.



Gas Flash Light for Signs

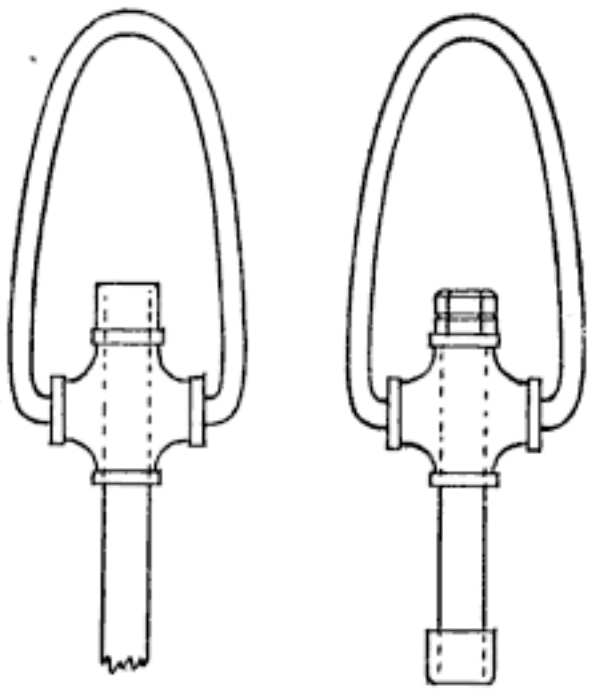
A diaphragm having a varying pressure upon it regulates the flow of the gas. When enough gas for a flash has entered the pipe, the diaphragm is forced up and automatically works a plug in a supply pipe. By this means a small quantity of the gas is let into the lamps at regular intervals, makes for an instant a flash of bright light and then goes out, except the little point of light which keeps the burner going.

The illustration shows how the gaslight flash signs are managed abroad. The lower part of the letter is hinged at the bottom and each letter is a sheet iron lantern with a reflecting back wall and fitted inside with an incandescent lamp. The front of the lantern is of opal glass to show up the characters. To prevent overheating and undue action of the wind, the air currents are carefully calculated. Clockwork regulates the flow which acts upon the gas supply to each letter, and each letter has a separate outlet, all being controlled by the rotation of the same cylinder.

The consumption of coal gas per letter is about half the full consumption of the incandescent burner used, and for ten letters, ten incandescent burners are enough, with a consumption of about 4.5 cubic feet each —that is, about 2.25 cubic feet of coal gas each in actual use, while with electricity 122 lamps of five candles each would be required. To compute a corresponding use of acetylene is easy. The cost with gas is about one-eighth that of electricity for the same purpose.

A ROPE SWIVEL FOR A WELL DRILLER

Take a 1¼-in. cross and run a 1-in. nipple through from top to bottom. Screw 1¼-in. pipe in the top and saw off flush with cross



Making a Rope Swivel

for swivel surface. Screw two lock nuts or one old coupling on the top of the 1-in. nipple and a coupling on the bottom for a 1-in. drill rod. Bend a piece of ¾-in. solid iron to the required shape for a ball and put the ends in the sides of the cross as shown in the illustration.—Contributed by N. G. Hall, Parker, S. D.

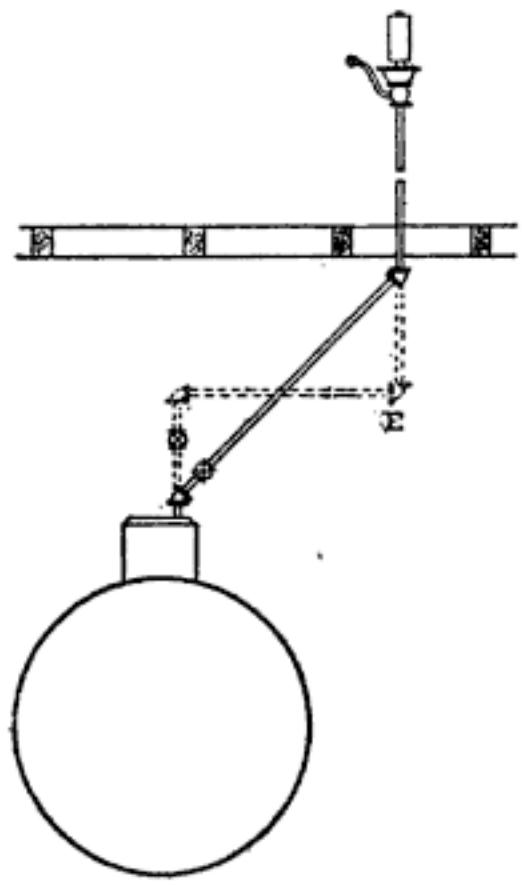
HANDY BOX RACK

Any one who has a large and varied collection of small stuff such as nuts, bolts, screws, washers, etc., will find a handy method of keeping them by using old cigar boxes. A label should be pasted on each box naming the contents. Then by using long nails driven into the wall above the bench the boxes can be arranged in a convenient order. The plan saves both time and supplies, besides giving a greatly improved appearance to the place.

A mixture of 1 part pitch, 1 part resin and 1 part plaster of paris is said to be a good cement for coating acid troughs.

HOW TO REMEDY A "SQUEAKY" WHISTLE

In a plant where the whistle squeaked it was found that water settling in a corner of the piping (E in the sketch), caused the trouble. A plan of the old piping is shown by the dotted lines in the sketch. To remedy the trouble two 45-degree elbows and two nipples were used as shown so that there was no pocket for the water to settle



To Keep a Whistle from Squeaking

in, says the Practical Engineer. Others annoyed in this way, may, on investigation, be able to apply a like remedy.

Weak sulphuric or hydrochloric acid in the proportion of one part of acid to six to ten parts of water is excellent for removing efflorescence from artificial stone. Scrub the facing of the stone with the liquid thoroughly.

To harden plaster of paris quickly, add powdered alum to the plaster water. This is better than salt for the purpose.

MECHANICS FOR YOUNG AMERICA

HOW TO MAKE A TURBINE ENGINE

By A. L. Burkhart

In the following article is described a machine which anyone can make, and which will be very interesting, as well as useful. It can be made without the use of a lathe, or other tools usually out of reach of the amateur mechanic. It is neat and efficient, and a model for speed and power. Babbitt metal is the material used in its construction, being cast in wooden molds. The casing for the wheel is cast in halves—a fact which must be kept in mind.

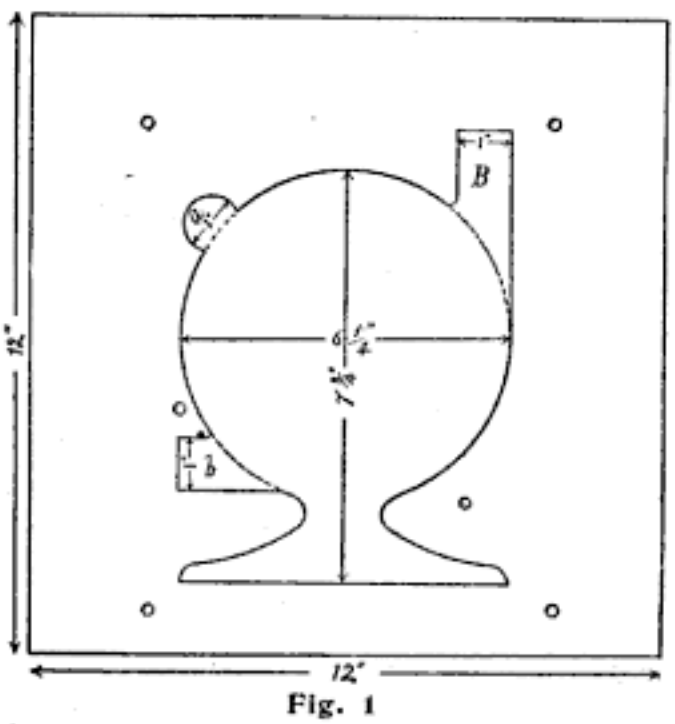


Fig. 1

First, procure a planed pine board 1x12 in. by 12 ft. long. Cut off six pieces 12 in. square, and, with a compass saw, cut out one piece as shown in Fig. 1, following the dotted lines, leaving the lug a, and the projections B and b to be cut out with a pocket-knife. Make the lug a ¼ in. deep, and the projections B, b, ½ in. deep. The entire cut should be slightly beveled.

Now take another piece of wood, and cut out a wheel, as shown in Fig. 2. This also should be slightly beveled. When it is finished, place it on one of the square pieces of wood, with the largest side down, then place the square piece out of which Fig. 1 was cut, around the wheel, with the open side down. (We shall call that side of a mold out of which a casting is drawn, the "open" side.) Place it so that it is even at the edge with the under square piece and place the wheel so that the space between the wheel and the other piece of wood is an even ⅛ in. all the way around. Then nail the wheel down firmly, and tack the other piece slightly.

Procure a thin board ¼ in. thick, and cut it out as shown in Fig. 3; then nail it, with pins or small nails, on the center of one of the square pieces of wood. Fit this to the two pieces just finished, with the thin wheel down—but first boring a ¾-in. hole ¼ in. deep, in the center of it; and boring a ⅜-in. hole entirely through at the same place. Now put mold No. 1 (for that is what we shall call this mold) in a vise, and bore six ¼-in. holes through it. Be careful to keep these holes well out in the solid part, as

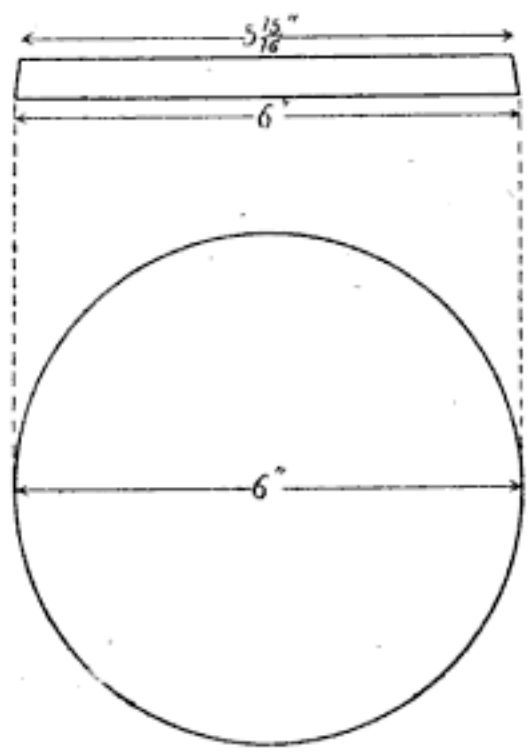


Fig. 2

shown by the black dots in Fig. 1. Take the mold apart, and clean all the shavings out of it; then bolt it together, and lay it away to dry.

Now take another of the 12-in. square pieces of wood, and cut it out as shown in Fig. 4, slightly beveled. After it is finished, place it between two of the 12-in.-square pieces of wood, one of which should have a ⅜-in. hole bored through its center. Then bolt together with six ¼-in. bolts, as shown

by the black dots in Fig. 4, and lay it away to dry. This is Mold No. 2.

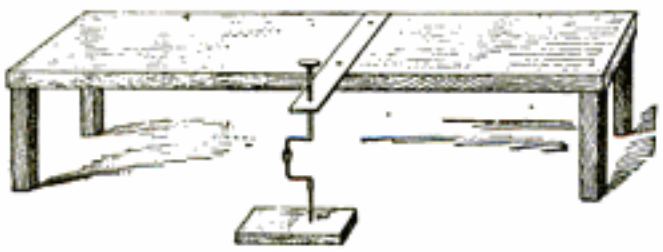
Now take Mold No. 1; see that the bolts are all tight; lay it on a level place, and pour babbitt metal into it, until it is full. Let it stand for half an hour, then loosen the bolts and remove the casting.

Now cut out one of the 12-in.-square pieces of wood as shown in Fig. 5. This is the same as Fig. 1, only the one is left-handed, the other right-handed. Put this together in Mold No. 1, instead of the right-handed piece; and run in babbitt metal again. The casting thus made will face together with the casting previously made.

Pour metal into Mold No. 2. This will cast a paddle-wheel, which is intended to turn inside of the casting already made.

If there should happen to be any holes or spots, where the casting did not fill out, fill them by placing a small piece of wood with a hole in it, over the defective part, and pouring metal in to fill it up.

If you cannot obtain the use of a drill press, take an ordinary brace, fasten a ⅜-in.



Using the Brace

drill in it, and bore a hole through the end of a strip about 16 in. long and 2 in. wide; put the top of the brace through this hole, and fasten the other end of the strip to a bench, as shown in illustration. Find the center of the paddle-wheel, place it under the drill, true it up with a square; and drill it entirely through. Find the centers of the insides of the other two castings, and drill them in the same manner.

A piece of mild steel 5 in. long, and ⅜ in. in diameter must now be obtained. This is for a shaft. Commencing 1½ in. from the one end, file the shaft off flat for a distance of 1 in. Then cut a slot in the paddle-wheel, and place the shaft inside of the paddle-wheel, with the flat part of the shaft turned to face the slot in the wheel. Pour metal into the slot to key the wheel on to the shaft.

The paddle-wheel is now ready to be fitted inside of the casing. It may be necessary to file some of the ends off the paddles, in order to let the paddle-wheel go into the

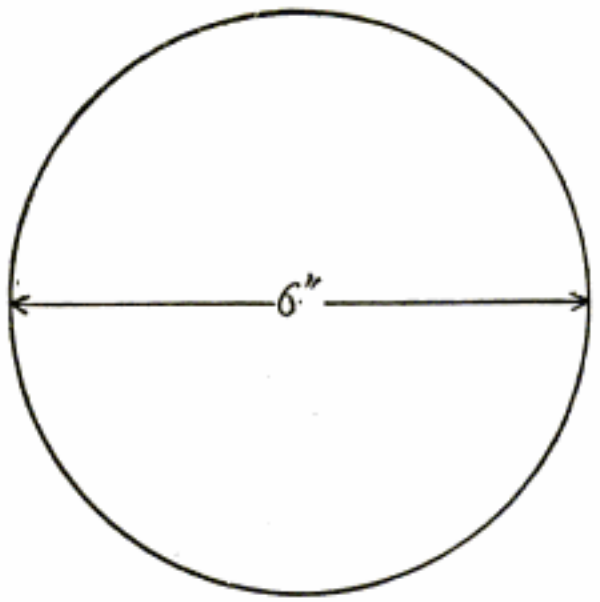


Fig. 3

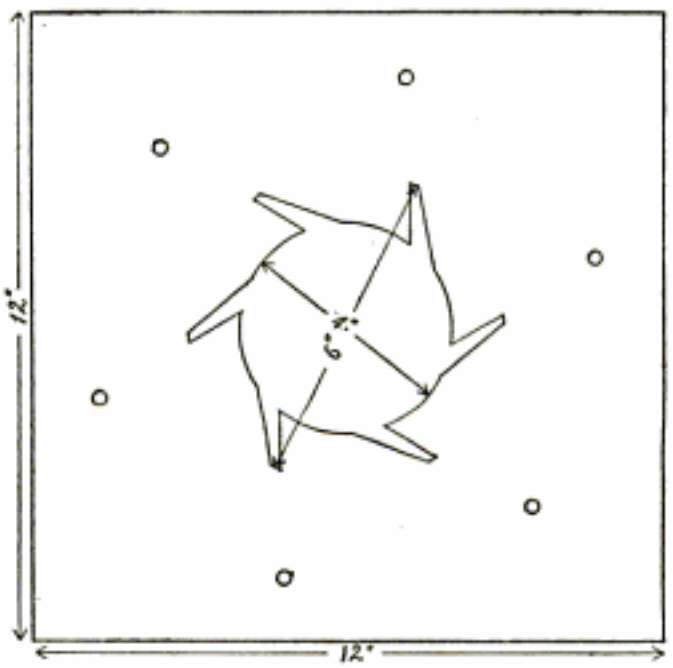


Fig. 4

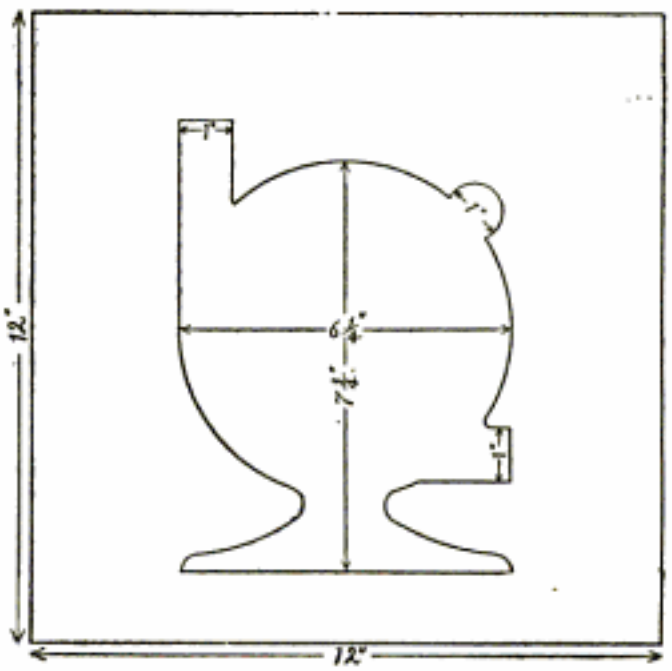


Fig. 5

casing. After it is fitted in, so that it will turn easily, place the entire machine in a vise, and bore three ¼-in. holes, one in the lug, one in the projections, B, b, and the other in the base, as shown by the black dots in Fig. 6. Also bore the port-hole in projection B, and the exhaust hole in projection b, and two ¼-in. holes at d, d, Fig. 6. Cut out a piece of gasket and fit it between the two castings. Then bolt the castings together, screw down, and connect to the boiler.

The reader must either cast a pulley out of babbitt metal, or else go to a machinist and get a collar turned, with a boss and a set screw, and with three small screw holes around the edge. Cut a small wooden wheel

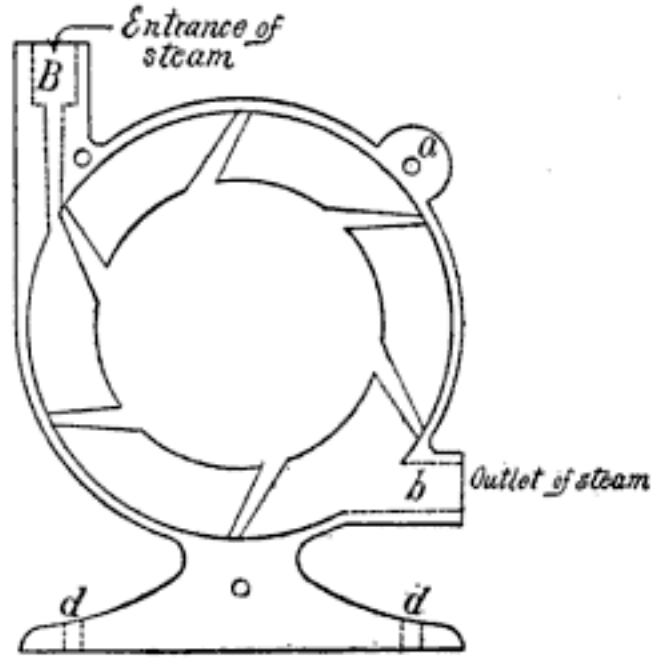


Diagram of complete machine

Fig. 6

out of wood; screw the collar fast to it; fasten it to the shaft of the turbine; and turn on the steam. Then take a knife or a chisel, and, while it is running at full speed, turn the wheel to the shape desired.

Your turbine engine is now ready for work, and if instructions have been carefully followed, will do good service.

HOW TO MAKE A LEAD CANNON

Any boy who has a little mechanical ability can make a very reliable cannon for his Fourth of July celebration by following the instructions given here:

Take a stick (a piece of curtain roller will do) 7 in. long. Make a shoulder as at A, Fig. 1, 4 in. from one end, making it as true and smooth as possible, as this is to be the muzzle of the cannon. Make the spindle as in Fig. 1, ¼ in. in diameter. Procure a good quality of stiff paper about 6 in. wide and wrap it around the shoulder of the stick, letting it extend ¾ in. beyond the end of the spindle, as at B, Fig. 2. Push an ordinary shingle nail through the paper

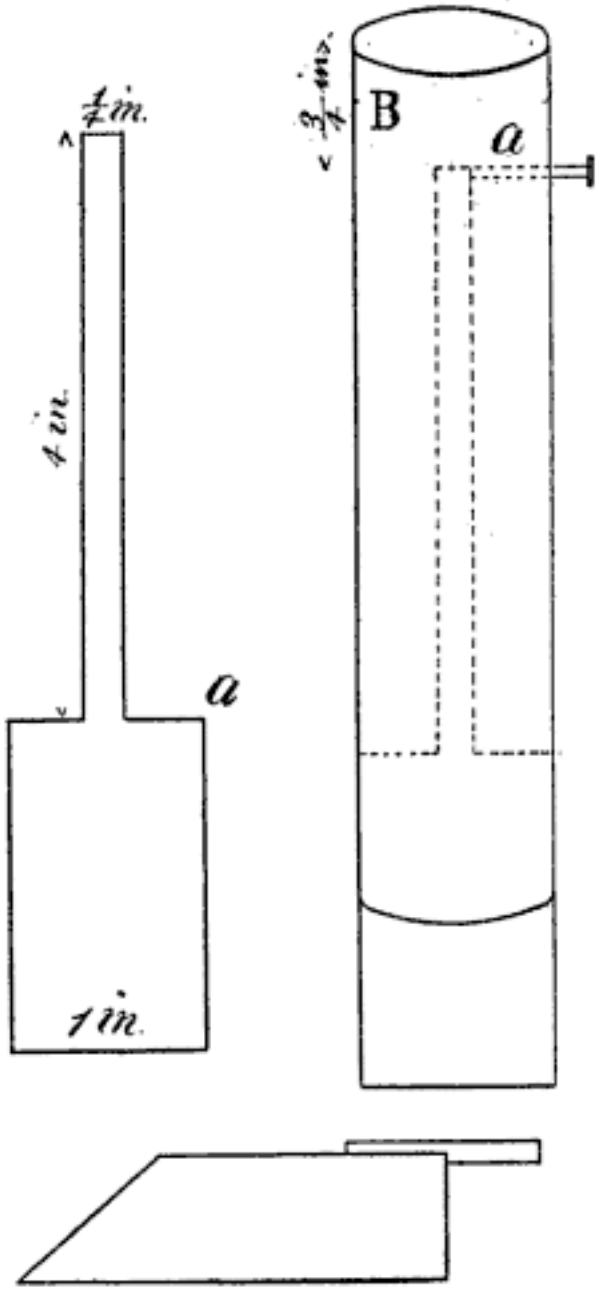


Fig. 1 **Fig. 2**

Fig. 3

and into the extreme end of the spindle as at A, Fig. 2. This is to form the fuse hole.

Having finished this, place stick and all in a pail of sand, being careful not to get the sand in it and letting the opening at the top extend a little above the surface of the sand. Then fill the paper cylinder with melted lead and let cool. Pull out the nail and stick, scrape off the paper and the cannon is ready for mounting as in Fig. 3.—Contributed by Chas. S. Chapman, Lanesboro, Minn.

The world's production of copper increased from 91,000 tons (1801-1810) to 2,269,199 tons during 1901-1904. This country produced 349,866 tons in 1904.

HOW TO MAKE A WIRELESS TELEGRAPH SYSTEM

By G. E. Collins

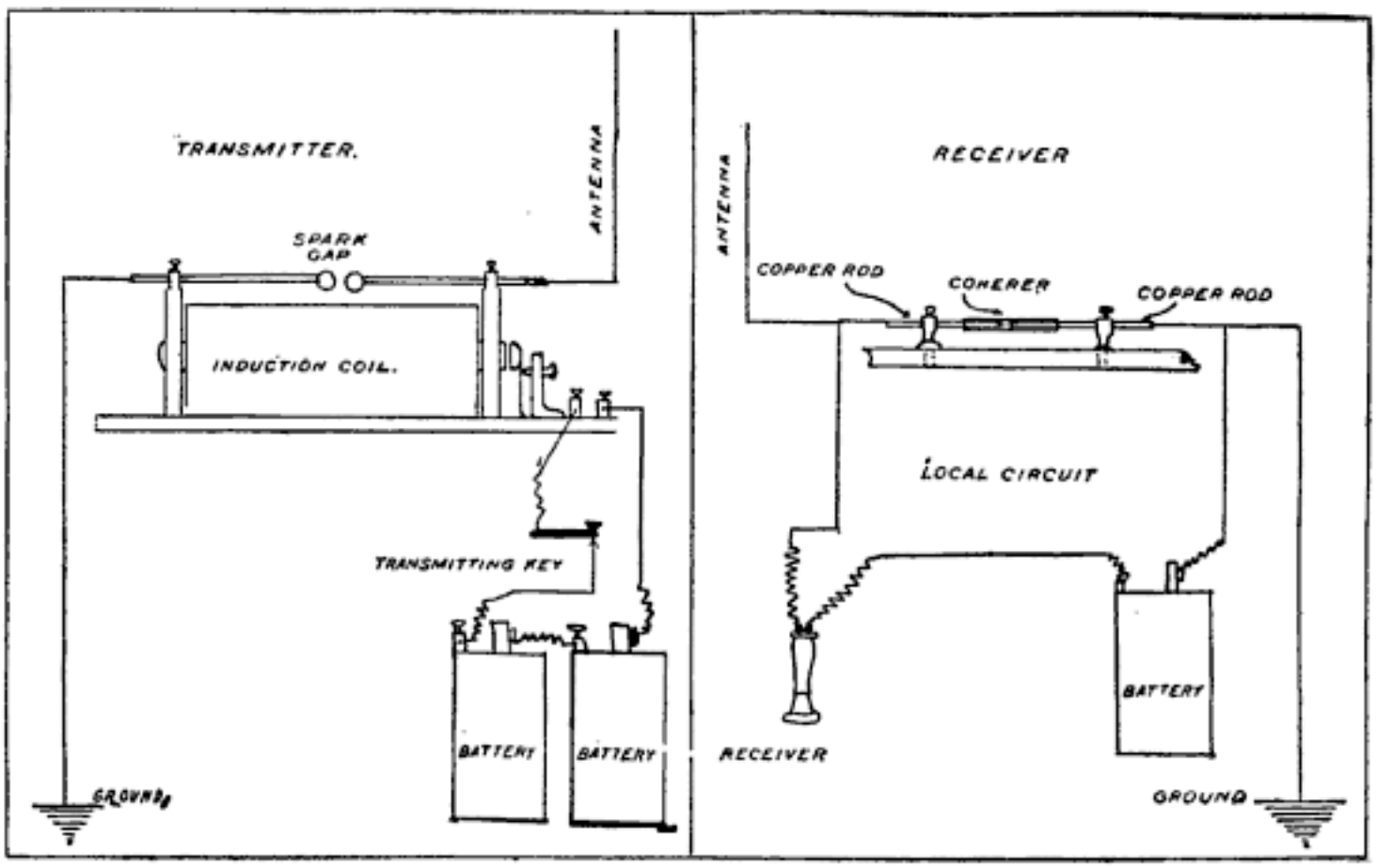
The wireless telegraphy plan shown in the accompanying sketch is one worked out by myself and is successful. Any other boy can easily make one for himself. I am eleven years old.

The transmitter consists of an induction coil giving a ⅛-in. spark between the spark gap or oscillators, two dry batteries and a transmitting key. The ground wire is connected to one oscillator and the other oscillator is connected to a wire 2 ft. in the air.

The receiver consists of a very sensitive instrument called the coherer. It may be made of a glass tube of 1-16 in. bore and 1½ in. long with some nickel filings loose in the tube and a copper rod fitted into each end so that they are 1-16 in. apart at the center of the tube. Between these ends are the nickel filings. It may then be mounted on a wooden base by binding posts.

When the coherer is completed get two dry batteries and a telephone receiver and connect as shown in the sketch. When connected pull the rods of the coherer out, just so the receiver thumps a little. When through telegraphing pull off the switch on the receiving apparatus.

When the switch is turned on and the transmitting key pressed the sound will be heard in the receiver. Use long buzzes for dashes and short ones for dots.

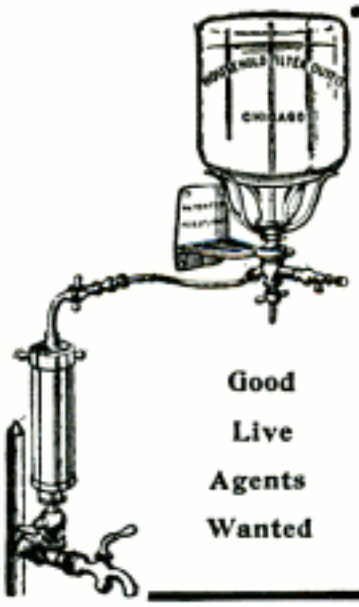


Home-Made Wireless Telegraph System

TEREDO-PROOF PILE COVERING

A pile covering that is said to withstand the ravages of the teredo and also to be proof against corrosion and the action of the sea water, is in use in British Columbia. Piles covered with the material and set three years ago are still in an excellent state of preservation, while those not treated are honeycombed by the teredo's work and must soon be renewed.

ANOTHER DESCRIPTIVE ARTICLE ON "HOW TO CONSTRUCT A WIRELESS TELEGRAPH" IS IN PREPARATION AND WILL APPEAR SOON. NEXT MONTH, "HOW TO MAKE AN ELECTRIC FURNACE REGULATOR"; VERY INTERESTING WORK FOR YOUNG ELECTRICIANS.



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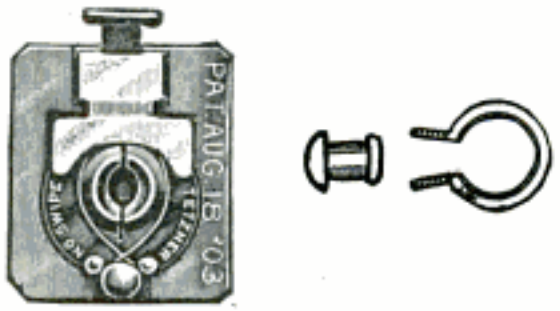

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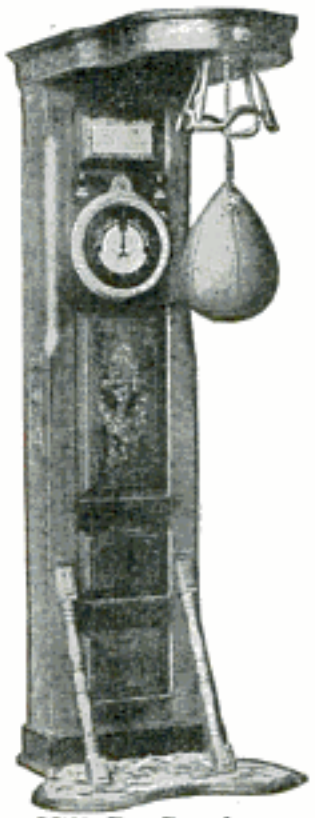

Mills Bag Puncher.

HERE IS ONE WHO KNOWS.

"YOUR Bag Punching Machine received, and the first day I took in $9.00.
JULIUS SIEGLE,
Hannibal, Mo."

Thirty days later Mr. Siegle wrote us:

"I would not take $500 for my Bag Puncher if I could not get another one."

And the machine cost him only $60.

Pretty good investment, eh?

All the money taken in is clear profit.

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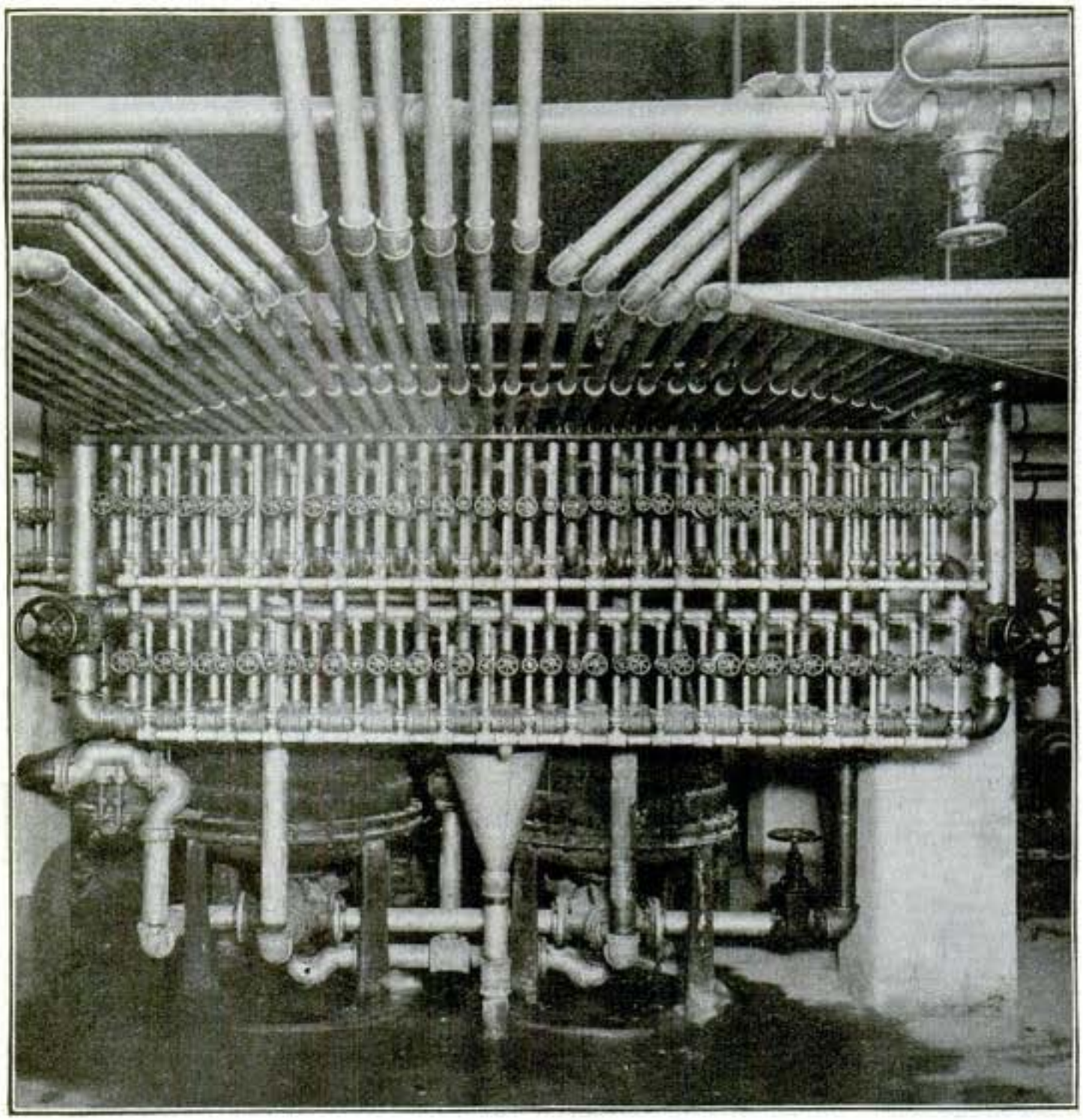
DOG LICENSE ON FISH.

A four-pound bass pulled out of a small lake near Oconomowoc, Wis., not long ago had a Milwaukee dog license, No. 1684 and issued in 1893, fastened to it. The records were investigated and the name and residence of the person to whom the license had been issued were found in an effort to discover how the license came to be in the lake. The person, however, no longer resided in the place. Local wit at last decided that the dog had drowned and some mermaid had fastened the license to the fish, adding, "Didn't you ever see a mermaid at Oconomowoc?"

AN INTRICATE JOB OF PIPING



Our illustration shows an intricate job of piping in connection with a filtering plant executed in Pittsburg, Pa., recently. Brass pipe, tinned inside and out, was the material used. We are indebted to the Official Organ of the United Association of Journeymen Plumbers, Gas Fitters, Steam Fitters and Steam Fitters' Helpers for the illustration.

CARRIER PIGEON CARRIED A SMALL LIBRARY.

During the siege of Paris, a generation ago, a carrier pigeon carried one one trip 40,000 messages, each averaging 20 words—a total of 800,000 words. The whole weight carried, however, was less than a gram. The messages were carried in a goose quill one and three-quarter inches long, which was fastened to one of the bird's tail feathers. The means used to make the quill contain so much was microscopic photography. The messages were first printed in ordinary type and then reduced by photography several hundred times. The photographs were taken on thin films, or pellicles of collodion, each of which, though it was less than two inches square, could thus contain 50,000 words.

Of these pellicles a pigeon could easily carry a dozen without interfering with its comfort or speed, and, as has been said, one bird alone conveyel 40,000 messages.

But a pigeon has carried as much as three-quarters of an ounce for a short distance. This weight would represent something like 800,000 messages, or 16,000,000 words; so that, under these conditions, it would be quite possible for a pigeon to carry a small library of 120 volumes on its tail. To read the messages they were first enlarged by photography to their original size.

THE LAST STRAW.

Senator Hansbrough, of North Dakota, has long been the owner of a country newspaper, says Harper's Weekly. Of late years other duties have prevented his giving it much attention, and he has depended on divers itinerant journalists.

"I've had some good men in the place, too," the Senator once observed to a friend; "men capable of holding an important place on a city daily. Then I have had some who did not altogether make good. I remember one in particular, a man named Linkwood. Linkwood was never satisfied with simplicity. He would refer to an 'equine horse,' and in the case of a tramp killed in a railroad accident said that the 'unfortunate man sustained a fracture of the spiral column.' Another of his pet expressions was 'tripping the light bombastic toe.'"

"You probably didn't keep him long," suggested the friend.

"Oh, I didn't mind these so much. But when the daughter of a leading citizen was married and he spoke of the bridal procession 'proceeding down the aisle to the entrancing strains of Mendel & Son's wedding march.' I decided that we had reached the parting of the ways."

ORIGIN OF THE WORD DERRICK.

How many mechanics or engineers have ever heard how this word originated?

In mechanical matters the name of the familar "derrick," a very common form of crane, has not the most honorable pedigree. Derrick was indeed nothing more exalted than the Tyburn hangman of the early part of the seventeenth century, and his name figures frequently in plays of the period. For more than a hundred years he gave his name to gibbets, whose "elevating" powers were applied in a more useful direction in the modern "derrick."

Webster says the word originally meant a gallows, from a hangman named Derrick.

The report of the census of the Philippine Islands taken in 1903 states that there are 3,141 islands in the group having a total area of 115,026 sq. mi. That there are 80,000 sq. mi. of forest lands growing 747 species of wood and valued at $3,000,000,000. There are also valuable coal deposits, sufficient to supply a large part of the Pacific commerce in addition to that required for home consumption, and there are large deposits of iron ore.

NEW BOOKS.

MODERN ELECTRICAL CONSTRUCTION. By Henry C. Horstmann and Victor H. Tousley, Pocket size, 4½x6½, 250 pages, 100 illustrations; full seal leather, round corners, red edges; price, $1.50. Frederick J. Drake & Co., Chicago.

This new work treats of practical electrical installation according to the requirements and rules of the National Board of Fire Underwriters. It is adapted both to the needs of the beginning electrician and as a handbook for the man of much experience. Detailed explanations and many cuts bring out every helpful or necessary point. Electrical inspectors also will find it of great assistance. One of the valuable features of the work is a number of tables concerning nails, screws, insulators, number of wires in conduit, etc. It is an ideal work for the practical electrician.

HOW TO MIX PAINTS. By C. Godfrey. Paper covers; 80 pp. Price, 50 cents. The Western Painter, Chicago.

This little volume is a simple treatise on mixing paints, prepared to meet the wants of the practical painter. The author selects some of the principal colors and gives the method of producing them, taking materials of ordinary quality as a basis. It is not exhaustive but accurate.

EASY LESSONS IN THE ART OF PRACTICAL WOOD CARVING. By Fred T. Hodgson. Size, 5½x8x1 in. thick; 300 pages; over 200 illustrations. Silk cloth binding, gold titles. Price, $1.50. Brotherhood edition, half seal leather, gold top. Price, $2.00. Frederick J. Drake & Co., Chicago.

The lessons given in this new book commence at the very beginning of carving, and lead the young workman by easy steps through the mazes of the art, until he is able to turn out work of a creditable character. The use and care of carvers' tools are given, and explained, and the tools described and shown by illustrations, with methods of sharpening and honing the tools. All sorts of appliances are shown, described, and illustrated, for holding the work, and for preparing the tools and finishing up the carvings. The various styles of carving are fully described. Lessons are given in each one of the styles, and also a description of the tools used, and methods of using them. A chapter on the kinds of wood best adapted for the several kinds of carvings is given. The work contains over 200 fine illustrations, with a number of full page plates, on which are designs made for actual working purposes. Illustrations of tools, showing shapes and sizes, and manner of handling them.

MODEL SAILING YACHTS, HOW TO BUILD, RIG AND SAIL THEM. Edited by Percival Marshall, A. I. Mech. E. Paper covers, 150 pages. Fully illustrated with diagrams and working drawings. Price, 50 cents. Percival Marshall & Co., London. American agents, Spon & Chamberlain, New York.

For the boy or man who wishes to obtain some practical information on yachts and yachting and who wishes to build a model craft; or to serve as a handbook for the more advanced yachtsman, this little book will be found just suited. It discusses at some length the rating of model yachts and deals with all the important details of construction, using many illustrations to make the subject clear, and explaining all nautical terms.

NEW USES FOR TELEPHONE.

The number of peculiar uses to which the telephone is put constantly increases. A few days ago a Pennsylvania minister married a couple who were 50 miles distant by means of the phone, and now a woman at Columbus, Ind., has had an instrument installed on a grave, so that she may converse with the dead at her convenience at home. The woman, who is a spiritualist, says that before the innovation of the phone she was obliged to go to the cementery to talk with the departed.

WILL CARRY FARM PRODUCE TO MARKET BY TROLLEY.

That farmers have been quick to appreciate the advantages resulting from the opening up of the country by the suburban electric lines is shown by the uses they have made of them. An electric line in Ohio will run on market days a train to be known as the "Marketmen's Special" for convenience of farmers and others who make weekly visits to their neighboring town. This train will arrive before the market opens and leave after it is closed. Low rates will be offered for the transporting of all market produce and provision will be made for the handling of live stock. The company has also offered the use of unused storage room at its freight station for market stands.

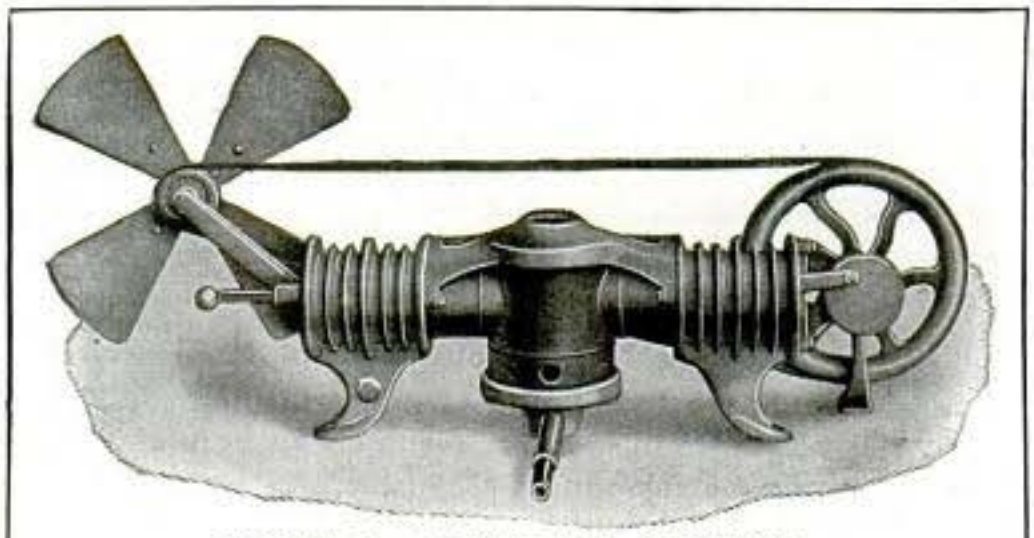
If this plan is successful the idea will most likely be taken up by other electric lines and thousands of farmers who now consume much time in driving to town on market days, will be able to avail themselves of this quick method of transportation and be the gainers thereby.

Hot Air Engine

FOR RUNNING FANS, WINDOW DISPLAYS, MODEL MACHINERY, PEANUT ROASTERS, SEWING MACHINES, ETC.

Runs with Gas, Alcohol or Gasoline

These engines are practical in use and require no attention when running beyond an occasional drop of oil. The small size for running a fan or several revolving window displays uses only 3 cents worth of gas in 10 hours with gas at $1 per thousand feet. The engine is perfectly safe, cannot explode and is far superior to any other small power yet perfected. The No. 1 weighs 18 lbs., has a speed of 500 revolutions per minute, grooved fly wheel 6¾ in. diameter, and furnishes 1-40th horsepower.



ENGINE No. 1, WITH FAN, PRICE $11
Or given for 20 subscribers to Popular Mechanics.

ENGINE No. 2

This engine has two cylinders, has twice the power of No. 1, and will run sewing machines and do other work of equal power. Burns gas only. Weight 30 lbs., 500 revolutions, uses 6 cents worth of gas per day. When used on sewing machines a speed controller to start, stop and regulate speed of sewing machine is required. Controller $2 extra. Controller not needed for continuous work.

Price of this Engine $18 or given with 35 subscribers to Popular Mechanics

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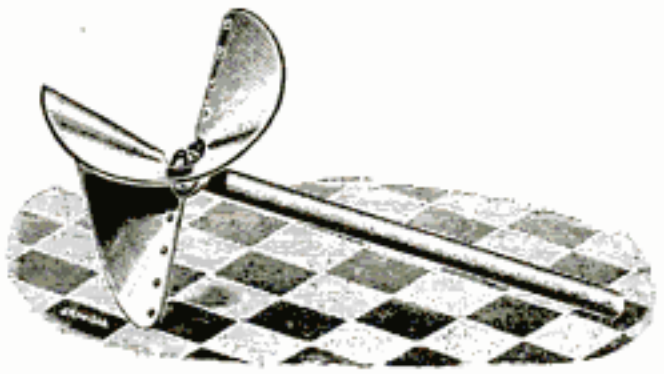
POPULAR MECHANICS

Journal Building **CHICAGO, ILL.**

NEW MECHANICAL DEVICES.

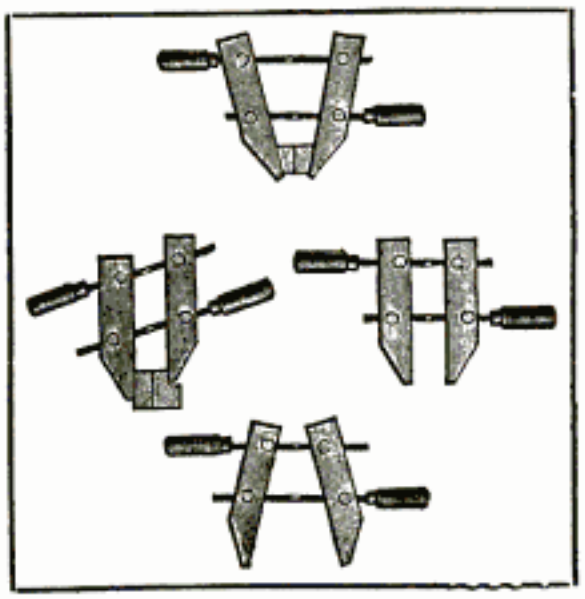
The Latest Things--Interesting, Useful and Time-Saving.

NEW PROPELLER BLADE.—What is claimed to be a new type of propeller blade for boats has been patented in England. It consists of a plain circular disk cut radially to the center, and the two edges thus formed opened out in opposite directions until they lie at right angles to the original plane of the disc. In propeller blades the maximum effect occurs at the edge of impact, and there is little advantage in widening each blade, as the water is deflected at once at the prime impact, and is but little affected by the following portions of the blades or



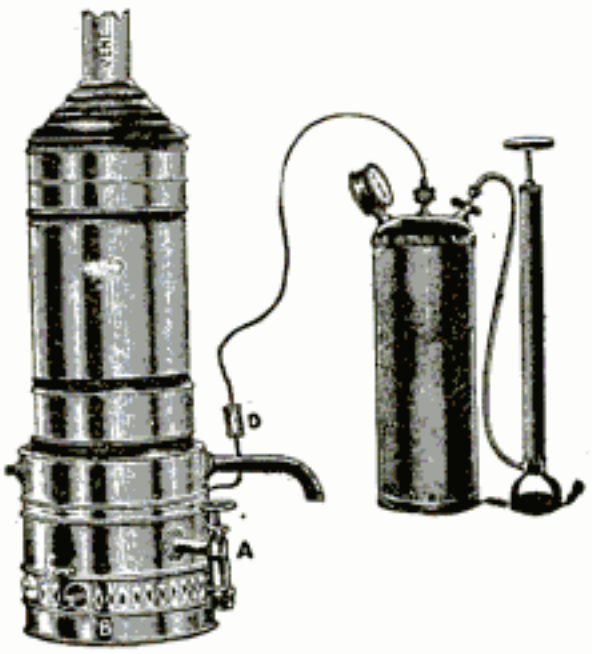
vanes. The principle involved is one of gradual and increasing deflection of the impinging medium, owing to the constantly increasing curvature of the blades; moreover, as the entering edge is exactly in the same plane as the motion of rotation there is complete absence of "shock" and remarkable smoothness of running. The whole area of the fan or propeller is effective.—Courtesy, Model Engineer, London.

ADJUSTABLE CLAMP.—This is a new tool which will adjust to any of the positions shown in the cut, or any modification of them. It works very quickly, its spindles being equipped with right and



left hand thread. Jaws will adjust to any angle; one jaw can be made to overlap the other, forming a position often desirable and obtained in no other clamp. Made in sizes: length of jaws from 7½ in. to 18 in.; opening between jaws from 4 in. to 14 in.

INSTANTANEOUS WATER HEATER.—Specially adapted for use where gas is not obtainable. A small air pump supplies air under pressure to a tank

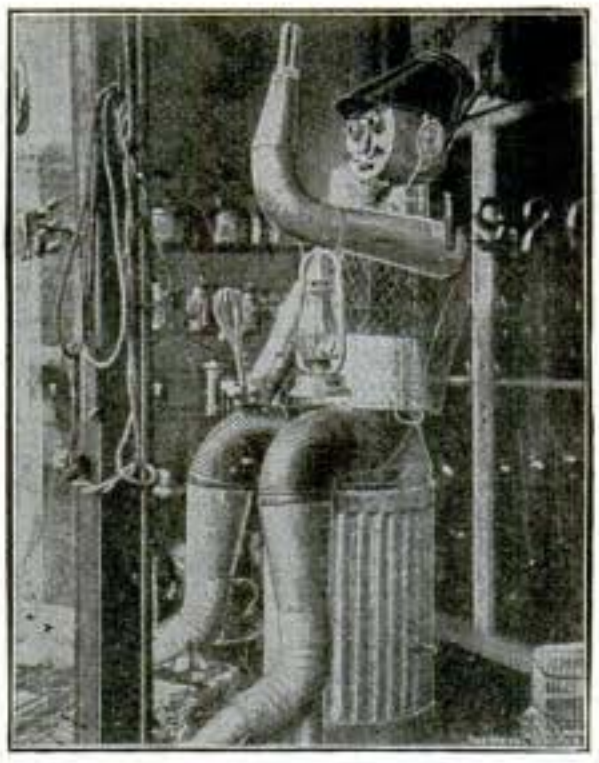


Water Heater.

where gasoline is vaporized and conducted through a small pipe to the water heater, where it burns with great intensity. One pumping will last several hours. The water will be hot enough for use almost immediately.

There's such a thing as caution, but I guess that when Hy Perkins set up all night with a gas-light 'cause the notice read not to blow it out, he was sort of overdoing it.—Sunset Magazine.

SHEET METAL MAN.—This unique window display was constructed by a hardware dealer in Birmingham, Ala., entirely out of goods in stock in



Created from Hardware Stock.

the store. The Metal Worker says any hardware man can duplicate this figure by an examination of the illustration.

BANDAGEEN.—A healing, antiseptic preparation for instant use in all kinds of wounds; furnished in an air tight bottle and will keep until used. Should be kept in every shop. Directions state: Allow wound to cleanse itself by bleeding freely for a minute, then cover wound with a piece of absorbent cotton and soak with Bandageen. The preparation is highly recommended by surgeons, and is germ, dirt and waterproof. Allays pain at once, and holds the cotton in place without the use of any plaster of paris or sticking plasters.

NEW ANAESTHETIC.—German papers report a new anaesthetic juice from a plant found in Japan; the preparation is called scopolamine. It is administered hypodermically, producing a lasting sleep of from eight to nine hours, and, it is claimed, without any ill after-effects.

PNEUMATIC BOAT CUSHIONS.—Made of rubber and inflated with a small hand pump. When deflated they fold into small space. Serves as an

Boat Cushions.

excellent life preserver, the ropes which extend around the edges being readily grasped and held.

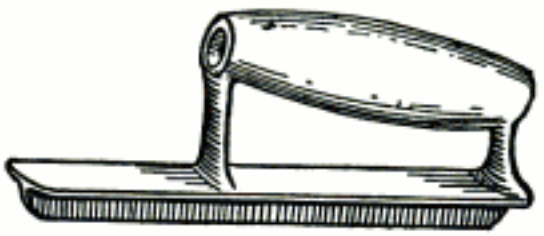
COMPACT CAMP STOVE.—This is a cooking and heating stove weighing 18 pounds, which can be taken apart and packed in a trunk. The pipe is

Camp Stove.

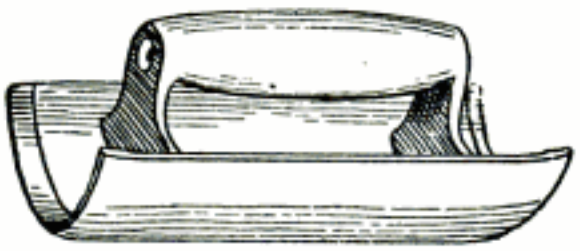
several feet long and telescopes to go with the legs inside the stove when packed. For campers, prospectors, hunters and sportsmen.

The steamship "Dakota," under construction by the Great Northern Company, is being fitted up with two elaborate telephone systems. One system puts the occupant of each room in communication with 150 other stations in the boat, the other system will be used in the boat's administration, and it is expected to largely supplant the gong and jingle systems hitherto in use.

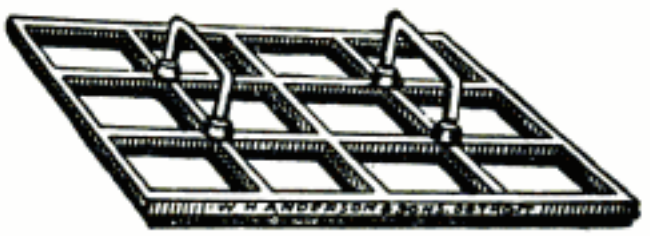
CEMENT WORKER'S TOOLS.—The illustrations will sufficiently explain these tools to all cement workers. The jointer cuts 5-16 in. deep; the driveway frame is 15x20 in. and makes 12 T-shaped



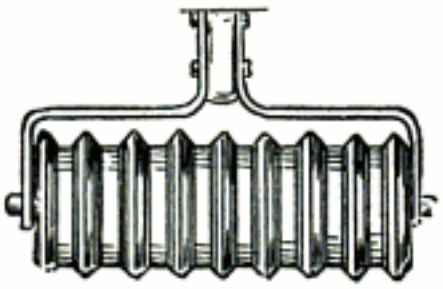
JOINTER.



ROUND CORNER SMOOTHING TROWEL.



DRIVEWAY IMPRESSION FRAME.



DRIVEWAY ROLLER.

impressions; the round corner smoothing trowel is made for circles of 2 and 2½ in. radius; the driveway roller makes grooves 1½ in. apart.

FISH KNIFE.—A knife specially made for use by fishermen and hunters, who will understand its advantages from an examination of the illustration.

COINS KILL GERMS.

Disease-producing germs do not live longer than 48 hours on coins and some live even a shorter period. The metal possesses antiseptic qualities which kill the germs. Dr. Park, a bacteriologist in the research laboratory of the department of health, has fully established this fact by a number of important experiments.

A piece of glass, two pieces of paper, four dimes, four nickels and six pennies were covered with a thin layer of diphtheria germs and at the end of 48 hours not one could be found on the coins, though those on the glass and paper were still living. In trying to ascertain just how long the germs can live on the coins, a number of pennies, nickels and dimes were collected from children who had diphtheria and were examined after six hours. Living germs were found on a number of them.

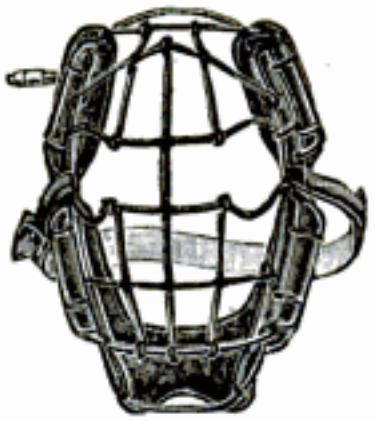
Coins were dropped in the "media", or food which is fed bacteria, and after 20 hours the copper and nickel coins rendered it strongly antiseptic. The silver coins made it only slightly so. Coins were laid on gelatine also and it was observed that no bacteria would grow near the coins. Coins collected from persons suffering with consumption were examined for tubercle bacilli at the end of 24 hours and 48 hours, but none could be found.

Paper money will carry thousands of germs a long while, and the discovery of some means of rendering them antiseptic at the time of manufacture so that, like the coins, they could kill their own germs, would be most valuable.

"POP." USEFUL IN MEXICO.

"Will you kindly state price for sending Popular Mechanics for one year to a gentleman living in England? I take your magazine regularly and have found more useful information in it than I could get in my 50 odd engineering books. Wishing you every success, Yours very sincerely," J. H. Ritchie, Torres, Sonora, Mexico.

PNEUMATIC CUSHION MASKS. — Playing baseball is becoming easier and safer all the time; before long we may expect to have all the hard work done by machines. A mechanical batter was invented some time ago, and the fielders and base runners could save a lot of running by using motor cycles. The pneumatic cushion mask is lined with soft rubber bags, which, when inflated fit the face easily, and never get hard and lumpy like the old kind that father used to wear.



WALL PAPER COST $500,000.

The wall paper on the walls of the office of a harness shop at Lamar, Mo., cost $500,000. The paper consists of the old checks issued by the owner of the shop for the last decade, war mementos in the shape of revenue stamps, and one wall is given over to checks of handsome design. The smallest check is for 67 cents and the largest for $18,400.

EXAMINERS OF WASTE-BASKETS AT WASHINGTON.

Two women in the Treasury Department at Washington have a unique employment. They are called "Examiners of Waste-Baskets," and that is indeed all that they do hour after hour from nine to four every day.

The litter from hundreds of baskets pass through their hands and theirs is indeed an important service. Each employe or clerk in the department possesses two tagged baskets, which he uses on alternate days, and it is required that all paper thrown into the basket be torn into two once. Nevertheless many documents find their way there that would cause great annoyance, if not actual loss of money, by their disappearance. Bank notes from one dollar up to ten thousand dollars are handled like so many pieces of paper and the chances of one or two falling into a basket any day are great. But rarely does a note or document pass unobserved through the hands of the expert women who go through the waste baskets and annually save thousands of dollars of Uncle Sam's good money.

BATTERY FAN MOTOR.—Three blade brass fan 7 in. diameter run by four high grade dry batteries. Will run 20 hours continuously, or 100 hours at infrequent intervals. Weight complete 16 lbs., fan motor weighs 5 lbs.

Battery Fan Motor.

UNIQUE ADVERTISEMENT.—This cut from the Metal Worker shows the unique announcement which a firm selling plumbers' supplies sends out in advance of its traveling men. The idea can easily be adapted to other lines of goods.

Unique Advertisement.

NEW BOOKS FOR SALE BY POPULAR MECHANICS

IRRIGATION AND DRAINAGE. By F. H. King. 500 pages; illustrated. Cloth. Price, $1.50. Although we have already a number of books on irrigation as well as on draining, the close relationship of these important factors in soil culture has never been so clearly and convincingly set forth as the author has done in this volume. He presents in a broad yet specific way the fundamental principles which underlie the methods of culture by irrigation and drainage.

LOCKS AND BUILDERS' HARDWARE. By Henry R. Towne. 1,117 pages; illustrated. Price, $3. Contents: Narrative and historical; mechanics of hardware; art metal-work and ornament; locks and latches; locks in sets; plain hardware; hardware groups; cabinet hardware; specifications.

DAIRYMAN'S MANUAL. By Henry Stewart. 475 pages; illustrated. Cloth. Price, $1.50. Dairy farming, if intelligently and systematically pursued, is one of the most profitable branches of agriculture, and this industry has advanced with greater strides during the last quarter of a century than any other of the great agricultural interests. The book embodies a full knowledge of improved methods and all that is latest and most valuable in dairy lore, and embraces the entire subject and will prove a trustworthy handbook to everyone who is interested in any part of dairying. Fully illustrated and substantially gotten up.

PRACTICAL FORESTRY. By Andrew S. Fuller. 349 pages; illustrated. Cloth. Price, $1.50. Treats of the propagation, planting, and cultivation, with a description and the botanical and popular names of all the indigenous trees of the United States, both evergreen and deciduous, with notes on a large number of the most valuable exotic species.

STEVENS' MECHANICAL CATECHISM. By H. G. Stevens, M. E. 335 pages. 4x6 inches. Illustrated. Cloth. Price, $1. The subjects treated in a most interesting and thorough manner. Not a technical work but a thorough and practical guide for every station and marine engineer, fireman, electrician, motorman and ice-machine man, in fact, for every mechanic.

ELECTRICITY.

PRACTICAL ELECTRICS. 135 pages; 126 illustrations; 8vo.; cloth. Price, 75c. The fifth edition of this universal handy book on everyday electrical matters. Contents: Alarms, batteries, bells, connections, carbons, coils, intensity coils, dynamo-electric machines, fire risks, measuring, microphones, motors, phonographs, photophones, storage, terminals, telephones.

A colored ventriloquist of Centerville, Md., has a peculiar idea of what might be considered funny, says the Monumental News. At a funeral in Queenstown, he threw his voice into the startling words, "Let me down easy, boys"—apparently from the mouth of the corpse. There was a general stampede; but, when order was finally restored, after the casket had been burst open to give the corpse air—only to find it a corpse still—the practical joker was taken in charge and consigned to the care of the sheriff, and the burial proceeded.

PANAMA'S NAVY.

The Republic of Panama has a navy. The navy is a steam yacht which was bought from a New York man. She will be armed with two 3-pounders and two automatic rapid-firers, which will give her an armament as heavy as the participants in a negro crap game usually carry. And she is commanded by an admiral from Kansas City.—Arkansas Gazette.

THE EXPOSITION OF THE GREAT NORTHWEST.

The Lewis and Clark Exposition, now being held at Portland, Ore., while fittingly commemorating the intrepidity of the explorers, who advanced into the wild country with little other aid than their own dauntless courage to sustain them, is practically the "coming out" of the great Northwest. The growth and progress of the Western country has been almost magical. It is less than sixty years since the first settlers of the country, the founders of its cities, among them the brave Marcus Whitman, were massacred by the Indians, and now the Northwest is calling the people of every nation to come and see of how great wealth and resources she is possessed; how she has been "finished" in the school of science and mechanics and art, and what her enthusiasms and aspirations are. Much that the old Eastern cities have gathered in through the slow centuries, the Northwest has acquired in her brief span of sixty years without sacrificing any of the exhilarating influences and cheer of a land where many of its inhabitants are also its pioneers.

Probably no more beautiful location in the country could have been selected in which to hold an exposition than the spot chosen for the site of the Lewis and Clark fair. The spurs of the noble Cascades with their forests of fir form the environs of the exposition grounds. From any point the white peaks of Hood, Jefferson, Saint Helen's, Adams, Tacoma or Ranier, Three Sisters and many others are in view; the Willamette and the noble Columbia with its many beautiful falls and its palisades are near by and the coast is but a few hours' run distant. Yet in the midst of all this primitive grandeur will be found the marvels of this age and others from every country under the sun. In place of the Pike and Midway of the previous fairs the exposition will have, what is more appropriate to the location, a "Trail." The Oregon climate is ideal.

Africa is being spanned by a great telegraph line reaching from the Cape to Cairo. At one place, where a swamp, 100 miles long, breaks the line, communications will be transmitted by means of wireless telegraphy.

"Want" and "For Sale" Ads. 2 cents per word, payable in advance. Replies may be sent to a number, care Popular Mechanics, and will be forwarded promptly without extra charge.

"SHOP NOTES"—Paper covers 50 cents. Popular Mechanics.

AUTOMOBILES.

FOR SALE—One gasoline motor 8 h. p. two cylinder $100. Also Dyke two-speed forward transmission $10. Dr. Hoffman, Plainfield, Ill.

FOR SALE—Automobile runabout 12 h. p. opposed gasoline engine; trap seat; thoroughly rebuilt. Positively a good servicable machine, $500. P. O. Box 250, Flora, Ind.

FOR SALE OR EXCHANGE—Automobile gear. Address C. C. H., 18 North Front St., Columbus, O.

FOR SALE—$285 buys 1903 Long Distance Runabout, costing over $1,250. Have another car reason for selling. The Starin Company, North Tonawanda, N. Y.

FOR SALE OR EXCHANGE—4 h. p. automobile or boat 4 cycle gasoline engine. Address A. P. C., 18 North Front St., Columbus, O.

BLACKSMITHS.

GOOD BLACKSMITHS ARE SCARCE AND BUT FEW LEARNING THE TRADE.

And the smith comes first of all professions or trades. The smith must make the tools first for all, from the surgeon to the safe blower, by using Toy's Treatise on new steels explaining how to work them with 75 new methods for working all difficult jobs. Ten receipts for making your own compounds for welding different kinds of steel solid. Thermite welding fully explained; also two colored tool tempering charts; chart A explains all annealing and hardening; Chart B explains both scientific and plain tempering to a standard. All the above for $1.00. Valuable samples free. W. M. Toy, Sidney, Ohio.

BUSINESS CHANCES.

FOR SALE—A very desirable machine and repair shop, residence, location and business; manufacture wood sawing machinery, which is in great demand; more business than can attend to; want to retire; a bargain. Irving Fox, Rochester, Minn.

FOR SALE—Blacksmith shop, house and barn in small inland town in Kansas doing good business and renting for $17 per month. Bargain at $1,400. W. S. R., care Popular Mechanics.

FOR SALE—Jewelry store. Optics and repairs pay all expenses. Only two competitors. Population 15,000. Stock and fixtures invoice $5,000 or over. Price $4,000 cash buys good will, etc. Stand established 25 years. Phil Levy, Henderson, Ky.

FOR SALE—Foundry and machine shop in town of 3,000; central Minnesota. Well equipped for repairing and manufacturing. Nearest competition 70 miles. Address Box 890, Litchfield, Minn.

START A MIRROR FACTORY in your town. There's money in it. We teach you and guarantee you success at once. Send 10 cents for sample mirror, particulars and testimonials. Do it now. None without. Hullinger's School, Francesville, Ind.

FOR SALE—Small steam laundry in thriving northwestern town; business and prices good; all bundle work. For full particulars address Box 82, Morden, Manitoba.

FOR SALE—A good poultry and dairy farm in the San Joaquin Valley; improved by a seven- room house, plastered and painted. Barn 30x42. Poultry, pigeon and rabbit houses. Over 400 Almond trees and a variety of fruit trees. For description and price, address E. D. Capwell, Merced, Cal.

FOR SALE—Foundry and Machine shop. Complete equipment for building mine cars. Location midway between the great coal fields of Indiana and Illinois. Also equipment for building several sizes of stationary and marine gas engines, and a good line of patterns for jobbing work. In a good manufacturing town, 2 railroads, 2 navigable rivers, no other foundry within 25 miles. Real estate, stock and tools invoice about $8,000.00. A great bargain. H. H. Mason, Mt. Carmel, Ill.

BROOM FACTORY—At a price that will open your eyes. Good reasons for selling; will invoice at about $125. Write to Milo Jamison, Newport, Ia.

FOR SALE—One-half interest in laundry to a practical launderer. Spring City Laundry, Waukesha, Wis.

Six Thousand acres of fine timber land in Idaho (deeded) for sale cheap if taken soon. Address W. J. Ramey, Nezperce, Idaho.

ENGINES.

A PRACTICAL BOOK, "Dies and Diemaking." Postpaid $1. J. L. Lucas, Bridgeport, Conn.

FOR SALE—One 13 by 12 Ball & Wood, high-speed engine; also one 35 kw. alternator. Address Vindex Co., Aurora, Ill.

MISCELLANEOUS.

WANTED—Experienced machine shop foreman. Must come well recommended. Address W. E. D., care Popular Mechanics.

AUTOMOBILES—Their operation, care, management and construction, together with scale drawings showing how an up-to-date machine can be built for $500, sent on receipt of request enclosing two-cent stamp. McLaren Automobile School, 54 N. 13th Street, Philadelphia.

BRAINS FOR SALE—Do you want a prospectus written and illustrated for your new company or syndicate? Do you want one that will command attention and sell shares? Do you need a catalogue or booklet that will not be thrown in the waste basket? If so write to Expert, care of Popular Machanics, Journal building, Chicago.

CAMERA FOR SALE—Vive camera, 3¼x3½ in., in good condition, $3. C. L. S., Popular Mechanics.

ADVERTISING COURSE FOR SALE—Full course of lessons from the foremost school in the country. Price $10. C. L. S., Popular Mechanics.

WHEN YOU WANT anything and don't know where to get it, write Popular Mechanics.

DEATH is said to be pleasant when it takes place by drowning; however, we do not believe you want to die that way. "How to Swim" is the book that will teach you how to swim. Contains 100 illustrations; sent postpaid for $1. Popular Mechanics.

WANTED—If you have anything in light metal manufacturing, job or experimental work, write me. Lowest prices. Schwabe & Son, 55 W. Washington St., Chicago.

GET OUR PRICE on Magnet Wire and Battery Lamps. Sale for this month only. Smith's Mail Order Supply House, 207-213 East Van Buren St., Chicago.

FOR SALE—Two new tool chests made of yellow poplar and built to stand rough usage. Inside measurements 31 by 18 by 16¾ in.; and one 38 by 24¾ by 23½ in. C. T. Hyatt, Eaton, Ind.

CAMERA OUTFIT—The best bargain yet . An Al Vista Panoramic camera outfit for pictures 5 by 12. Write for full particulars. Otto Glasow, Medford, Wis.

ATTENTION MACHINISTS and carpenters. We wish to let you know that we carry a full line of mechanical tools of all descriptions. We are giving the readers of Popular Mechanics an opportunity to get good tools at cut rate prices. We carry all makes. Write for one of our 6 in. hook rules, price 60 cents. Send for catalogues. Eureka Tool Supply Co., Wilkinsburg, Pa.

FOR SALE—One gasoline brazier; one 8-inch Smith blower with connecting shaft; one 8 h. p. electric motor; several emery grinders; one air compressor; also a lot of patterns for 2 h. p. gasoline engines. J. D. Schulz, Box 176 North Chicago, Ill.

SMALL STEEL CANNONS—Several left over from last year; 10 in., $1.25; 12 in., $1.75; 15 in., $2.50; and breech loading 12-guage, $5. If you write inclose stamp, castings, etc. Salineville Model & Machine Works, Salineville, O.

WANTED—A second-hand gasoline motor, between 1 and 4 h. p. Must be in good condition. Henry Rettke, 18 Grave St., Marinette, Wis.

MISCELLANEOUS.—(Continued)

FOR SALE—Two h. p. motor cycle engine, castings nearly finished, or will exchange for small 110 volt motor. Rey Bascom, 224 South 4th St., Steubenville, O.

FOR SALE—Columbian graphophone, good as new. Send for photo. and description. E. Bevard, Waverly, O.

WE CAN TELL you where to get good bargains in all kinds of second hand machinery. Popular Mechanics.

A PRACTICAL BOOK, "Dies and Diemaking." Postpaid $1. J. L. Lucas, Bridgeport, Conn.

FOR SALE or trade—Gurley vernier transit compass. Want 8 by 10 view camera, small engine, boiler, or technical books. Knight Bros., Crown Point, Ind.

FOR SALE—One voltamp medical battery No. 6, good as new, $3. G. M. Hyatt, Eaton, Ind.

FOR SALE—Poultry, Barred Plymouth Rocks, 200 fine young, soon ready to ship. Eggs $1 per setting for July. Correspondence solicited. Circulars free. Frank J. Overstreet, Kiowa, Kans.

FOR SALE—National typewriter, in good condition. Will exchange for second-hand lathe. C. W. Baldwin, Council Grove, Kans.

WANTED—Second-hand engine lathe, with 20 to 24 in. swing, 7 to 8 ft. from center to center. Fred Grimm, Tustin, Wis.

FOR SALE or trade—Italian harp. Jesse Gibson, Florence, Neb.

FOR SALE—One motor cycle frame, complete, $25. One motor 1¼ h. p., complete, $25. Both new and big bargains. M. J. Taylor, Camden, Mich.

FOR SALE—Electrical supplies and apparatus of every description. Amateur supplies at wonderfully low prices. Send stamp for bargain sheet of new and second-hand goods and catalog of supplies. T. Binford Electric Works, 994 Washington Boulevard, Chicago, Ill.

FOR SALE—Syracuse chainless bicycle, new, $35, cost $75. B. G. Raymond, St. Cloud, Minn.

A BARGAIN—Drawing outfit, value $12.50, with fine German silver instruments. Used only short time. Price, $6.50. Address Dwight W. Dilty, Greenville, O.

ENGINEER'S LICENSE—Engineers, electricians, firemen and machinists, send for free pamphlet describing Spangenberg's Steam and Electrical Engineering; 672 pages; 648 illustrations; 1,035 questions and answers; just out; best book ever published. Geo. Zeller Book Co., St. Louis, Mo.

FOR SALE—Two correspondence courses; one on electrical work, the other on plane and solid geometry; by the foremost correspondence schools in the country. Also a ½ h. p. motor, 220-volt. Address H. G. P., Popular Mechanics.

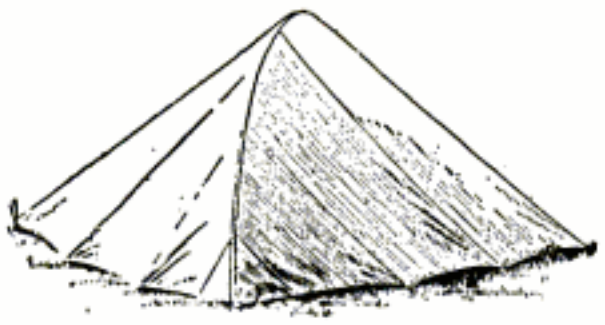
FOR SALE—Shop right to make and sell recently patented article. Cheap; sells at sight to housekeepers; any mechanic can make it. Sells at 30 cents. Half profit. No expensive machinery. Start on few dollars. Address Zeta Machine Shop, Lock Box 63, Bloomfield, Mo.

WANTED—Good 4x5 kodak for film or plates; must be cheap for cash. J. C. Nelson, Grandin, N. Dak.

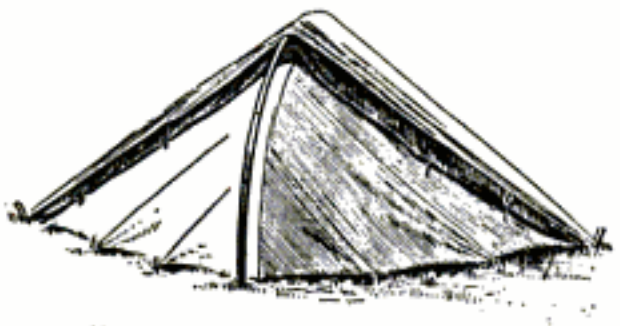
PORTABLE TENT for campers, miners and explorers. The frame is made of four wooden sections which slide past each other to the length of one section, for packing. To pitch the tent the frame

The frame in position and tent properly pegged

Tent upon frame ready to pull in direction desired



Full view of tent set up ready for occupancy



Double tent—a perfect shelter from extreme heat or cold

is drawn out to full length and the ends stuck in the ground 6 in. This leaves the arched frame twice as wide as its height. Two pegs are driven, to which the canvas is fastened; then the canvas is drawn over the frame. In ordinary weather only two pegs are needed. In stormy or very hot weather a second and larger frame and canvas can be placed over the first.

The single tent and frame can be erected in 90 seconds.

WORK BENCH.—This bench is recommended as specially desirable for use by amateurs, youths, and those who do not need to use a bench constantly. It is 4 ft. long exclusive of the vises, of which there

are two. It has back board and tool rack, holes for stops, and maple top. Bench is 20 in. wide, 32 in. high and is very substantially made. Is quite inexpensive and will last a lifetime.

GROUPS OF MECHANICAL FIGURES.—Each of these groups consists of miniature beings, which perform a great variety of movements and operations. One group, called "Mechanical Acrobats," consists of six men, 6 in. tall, in a playhouse, each of whom performs some distinct acrobatic feat. In "Sundown on the Levee" there are six negroes who play the jewsharp, pick a banjo, flourish rattle bones, beat time with their feet, etc. The best piece, however, is a scene in a steel works, where two forges in operation give off smoke and the figures beat iron in the forges, operate a stamping machine, etc. The figures have both elbow and shoulder motion, and the number of mechanical movements involved is amazing.

THRIPS, A NEW ORCHARD PEST.

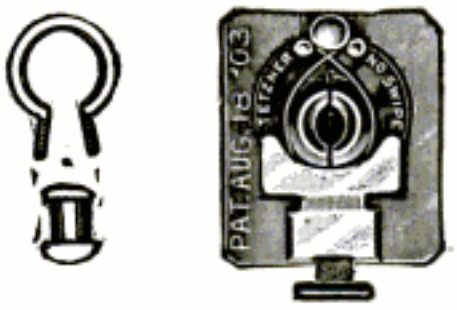
The thrip is a new pest which threatens the orchards of the West; that is, it is new to the public, for scientists have had thrips on the bad list for some years. It is a very small, black insect which goes from one blossom to another killing the buds. The usual methods for destroying insects are harmless to the thrip, which has the faculty of retiring within itself and closing its breathing pores. The thrip trust, however, is destined to be short lived, for already another insect has appeared, the raphidian, which thrives on thrips and is otherwise well behaved and does not harm trees.

CHERRY TREE ALARM.—Where a person has only a few cherry trees and is specially anxious to preserve them from depredation by birds, the following plan will prove quite helpful. Suspend an electric ball in each tree and connect all the bells to the necessary number of dry batteries. A push button can be located in the house and the bells rung at frequent intervals. Or a make-and-break device can be rigged with the worn out works of a clock by which the bells will sound automatically at frequent intervals.

A writer in Amateur Work recommends the use of buzzers instead of bells, the buzzers being placed in metal megaphones to increase the sound.

ORCHARD DUSTER.—This is a portable device operated by a hand crank which throws a stream of desired size of dust, powdered chemicals, etc., on the principle of the spraying machines. Said to be less work and more effective than liquid spraying.

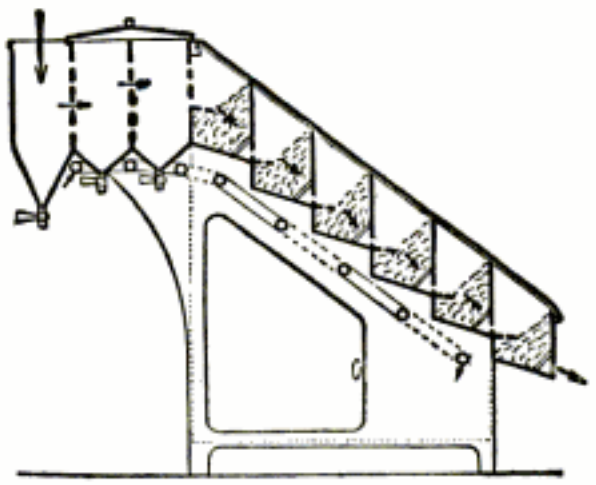
WATCH PROTECTOR.—This entirely new and simple device is a positive protection against the loss of your watch by pickpockets. It is easily attached to any pocket, corset or dress. Does not



Watch Protector.

interfere in the removal of the watch by the wearer, but makes it impossible for any other person to do so without your knowledge. Good sport can be had by requesting your friends to take your watch from your pocket when they ask you what time it is.

APPARATUS FOR CLEANING MACHINE OIL.—Oil which has been used in running engines, dynamos and motors is introduced in the clotted state into a settling chamber at the top of the device. The liquid passes thence in the direction of the arrows through two other settling chambers, each



Oil Cleaning Device.

having at the bottom a faucet through which sediment may be removed. The oil then passes through a series of filtering chambers arranged on an inclined plane. From the last filter it is removed ready for use.

When you have a good shop "kink" send it in and let others have the benefit of your ideas.

CATALOGS RECEIVED.

EVERYTHING FOR YOU AND YOUR AUTO is the appropriate title of a handsome catalog recently issued by the Motor Car Supply Co., of Chicago. The book will be found valuable to autoists in that it gives them a great variety of the various devices as well as special and suitable apparel for automobiling from which to choose. The completeness of the book is one of its chief merits.

CATALOG NO. 21, issued by the Capital Gas Engine Company, Indianapolis, contains a great deal of interesting information on the gas engine for all those who have use for these machines. The pamphlet is well illustrated with diagrams and engravings.

AIR AND GAS COMPRESSORS.—A 175-page book, L 510, describing and illustrating a complete line of steam, electric, gas and power-driven compressors of all types, including single and duplex and simple and compound; single and multi-stage, etc., is being distributed by the Laidlaw-Dunn-Gordon Co., 114 Liberty street, New York City. It gives the results of the latest investigations upon air-valve gears (the most critical feature of an air compressor) and shows a gear combining the quietness, efficiency and high speed qualities of mechanically-moved valves with the elasticity of poppet valves.

It also explains the air lift for raising water from driven or bored wells, gives the amount of air required for pumps and drills, tells how to calculate pipe lines for compressed air, explains the effects of altitude and temperature, discusses the advantages of compounding and intercooling, the advantages of different valve gears for different purposes, the several methods of driving, and gives data on a hundred other things of use and interest to every actual or prospective user of compressed air. The book is a valuable addition to any technical library. Please mention this magazine.

BOOK OF TABLES FREE.—A valuable little book of 200 pages, containing many reference tables for the use of engineers and boiler room men. Subjects treated include steam boilers, boiler horsepower and how to calculate it, chimneys, engine horsepower, belting, fusing point of metals, etc., etc. We have arranged to have a copy of this book, "No. 8," sent free to any boiler or engine room man who will mention Popular Mechanics in his request. Address Wm. Powell Co., 2525 Spring Grove avenue, Cincinnati, O.

A CONFESSION.

I've been down to the city, and I've seen the 'lectric lights,
The twenty-story buildin's and the other stunnin' sights;
I've seen th' trolley cars a-rushin' madly down the street
An' all the place a-lookin' like a fairy-land complete.
But I'd rather see the big trees that's a-growin' up to home,
An' watch the stars a-twinklin' in the blue and lofty dome;
An' I'd rather hear the wind that goes a-singin' past the door
Than the traffic of the city, with its bustle an' its roar.

I reckon I'm peculiar, an' my tastes is kind o' low;
But what's the use denyin' things that certainly is so?
I went up to a concert, an' I heard the music there;
It sounded like angelic harps a-floatin' through the air.
Yet spite of all its glory an' the gladness an' acclaim,
If I stopped to think a minute, I was homesick jes' the same;
An' I couldn't help confessin', though it seems a curious thing,
That I'd rather hear a robin sweetly pipin' in the spring.

—Washington Star.

A WARNING TO MARINERS.

"On Monday the Admiralty issued a warning to mariners that they should not navigate within six nautical miles of the coast of the Pescadores, owing to the presence in those waters of 'dangerous objects.' "—Japan Times, Tokyo, May 13, 1905.

Evidently the Russian fleet got within six nautical miles of some such place.

PRESERVING WOODS IN SUGAR.

In a new process for aging and preserving woods beet sugar or saccharine replaces the sap in the trees and drives out the natural humidity. The newly felled wood is loaded on a truck, which is rolled into a huge cylinder, provided with pipes through which either hot or cold water may be introduced. The cylinder is then supplied with sugar, and hot water is forced through the pipes; the heat boils the sugar, which penetrates the pores of the wood. Cold water is then sent through the pipes to cool the interior and the wood is conveyed into a special room, where it is dried by hot air. After this process, it is again cooled and ready for use. Insects cannot destroy wood so treated, it is said.

MORE MONEY

is made from Patents than from any other class of Investments. . .

SUCCESS SURE

IF YOU HAVE A GOOD INVENTION BACKED BY A STRONG PATENT AND BUSINESS ABILITY.

THE FIRST STEP

If you have made an invention and contemplate applying for a patent, the first point is to learn whether your idea is new and patentable. Do not depend on the fact that you or your friends have never seen anything of the kind. Send us a pencil drawing, showing plainly your invention, and write out a description of its construction and operation, as well as you can. If you have a model, send it instead of the drawing. We will compare your sketch or model with all patents issued in the United States for inventions resembling yours, and for inventions in which similar mechanical constructions or principles are used. If a patent is found for an invention exactly like or closely resembling your idea, we will send you a copy of such a patent. If nothing is discovered to prevent getting a patent for your invention we will so advise you.

The charge for this service, unless otherwise agreed upon by special arrangement, is five dollars. This examination is an important step in connection with every patent application and requires great care and skill. An incompetent attorney may overlook a patent which closely resembles or completely anticipates your invention, or he may not know where to look. A dishonest attorney will purposely fail to find an anticipating patent in order that he may get the fee for preparing the application. The inventor is the loser in either case.

WHAT A PATENT COSTS

Opinion as to novelty and patentability of an invention, *after thorough examination* of United States patents	$ 5.00
Preparing official drawing—one sheet	5.00
Preparing Oath, Petition, Specification and Claims	15.00
First Government Fee	15.00
Prosecuting application for patent	10.00
Total cost of application, first Government fee, official drawing, preparing all papers and prosecuting application in Patent Office	45.00
Within six months after the application has been allowed, the Government charges a final fee of	20.00
Thus the total cost of a patent for a simple invention is	65.00

Intricate inventions cost more to patent, but we will state the exact cost in advance in each case. We assist our clients in selling and promoting their patents without advance charges.

POPULAR MECHANICS PATENT BUREAU

Main Office: Journal Building, Chicago, Illinois

Associate Offices: WASHINGTON, D. C., LONDON, BERLIN and other large cities.

MANUFACTURERS WANTED

To Make the Following Articles:

Popular Mechanics has received during the past month inquiries from parties desiring to contract with responsible manufacturers for the manufacture of the following articles.

In corresponding be sure to give the Inquiry Number.

No. 1064—THREAD TOOL.
No. 1065—BURGLAR DEVICE: Wants 1,000 lots.
No. 1066—GARMENT ATTACHMENT: Wants 10,000 lots.
No. 1067—TWIN CLOTHES PIN: Wants 1, 5 and 10,000 lots.
No. 1068—SHADE AND SOCKET: Wants 10,000.
No. 1069—WINDOW CLEANER: Wants 1, 5 and 10,000 lots.
No. 1070—BUGGY SEAT: Wants 1,000.
No. 1071—WIRE BINDER: Wants 1,000.
No. 1072—DOOR LATCH: Wants 500 lots.
No. 1073—SPECIAL COILS: Wants 5,000 lots.
No. 1074—PRINTING ROLLERS: Wants 500 and 1,000 lots.
No. 1075—ADJUSTABLE SHELVES: Wants 100 lots.
No. 1076—DETACHABLE HANDLE: Wants 10,000 lots.
No. 1077—SASH CORD HOLDER: Wants 1,000 lots.
No. 1078—CHEESE CASE: Wants sample.
No. 1079—CIGAR BOX MARKERS: Wants 50,000.
No. 1080—EXERCISING APPARATUS: Wants 3,000 sets.
No. 1081—OIL CAN HOLDER: Wants 1,000.
No. 1082—SUPPORT FOR ELECTRIC FIXTURES.
No. 1083—BOOT AND SHOE FASTENER: Wants 1,000 gross lots.
No. 1084—WIRE DEVICE: Wants 25,000.
No. 1085—CANDLE STOCK: Wants 5,000 lots.
No. 1086—CUFF HOLDER: Wants 500 pairs.
No. 1087—BUGGY BOOT: Wants 1,000 lots.
No. 1088—DOOR LOCK: Wants 5,000 lots.
No. 1089—SPARK PLUG: Wants 1,000 lots.
No. 1090—FISH HOOK: Wants 1,000 lots.
No. 1091—REVOLVING BLOTTER: Wants 5,000 lots.
No. 1092—ADDING MACHINE DIES.
No. 1093—EGG BEATER: Wants 10, 25 and 50,000 lots.
No. 1094—PIN TICKET: Wants 5,000,000.
No. 1095—BUCKLE: Wants 100 gross.
No. 1096—CARBONATORS: Wants 1,000.
No. 1097—WINDOW SHADE SUPPORT: Wants 1, 5 and 10,000 lots.
No. 1098—BOTTLE STOPPER: Wants 1,000 lots.
No. 1099—COAT HANGER: Wants 1,000 lots.
No. 1100—FIRE ESCAPE.
No. 1101—MANIFOLDING DEVICE: Wants 5,000 lots.
No. 1102—SASH FASTENER: Wants 1 to 5,000 lots.
No. 1103—TACK PULLER.
No. 1104—FIRE EXTINGUISHER: Wants 100 and 1,000 lots.
No. 1105—MAGNET PIPE, ½ in.x5 in.
No. 1106—BACK BAND BUCKLE.
No. 1107—CURLING IRON HOLDER.
No. 1108—WASHING MACHINE.
No. 1109—LAND MARKER.
No. 1110—THIMBLE.
No. 1111—LADIES' HAT PIN: Wants 2, 5 and 10,000 lots.
No. 1112—FRUIT PICKER.
No. 1113—HORSESHOE CALK: Wants 1,000 lots.
No. 1114—SCISSORS.
No. 1115—CRATE: Wants 500 to 1,000 lots.
No. 1116—NUT LOCK: Prefers semi-finished hexagon nuts from ½ to ⅝ in.
No. 1117—TROUSER PRESSER: Wants 100 to 1,000 lots.
No. 1118—CARRIAGE TOP BOWS.
No. 1119—PAPER HANGING DEVICE: Wants 100 sets.
No. 1120—SHOCKER FOR GRAIN BINDERS: Wants sample.
No. 1121—NURSERY STOVE: Wants 6.
No. 1122—METAL PARTS.
No. 1123—THIN RAZOR BLADE: Wants several thousand.

For Details Address

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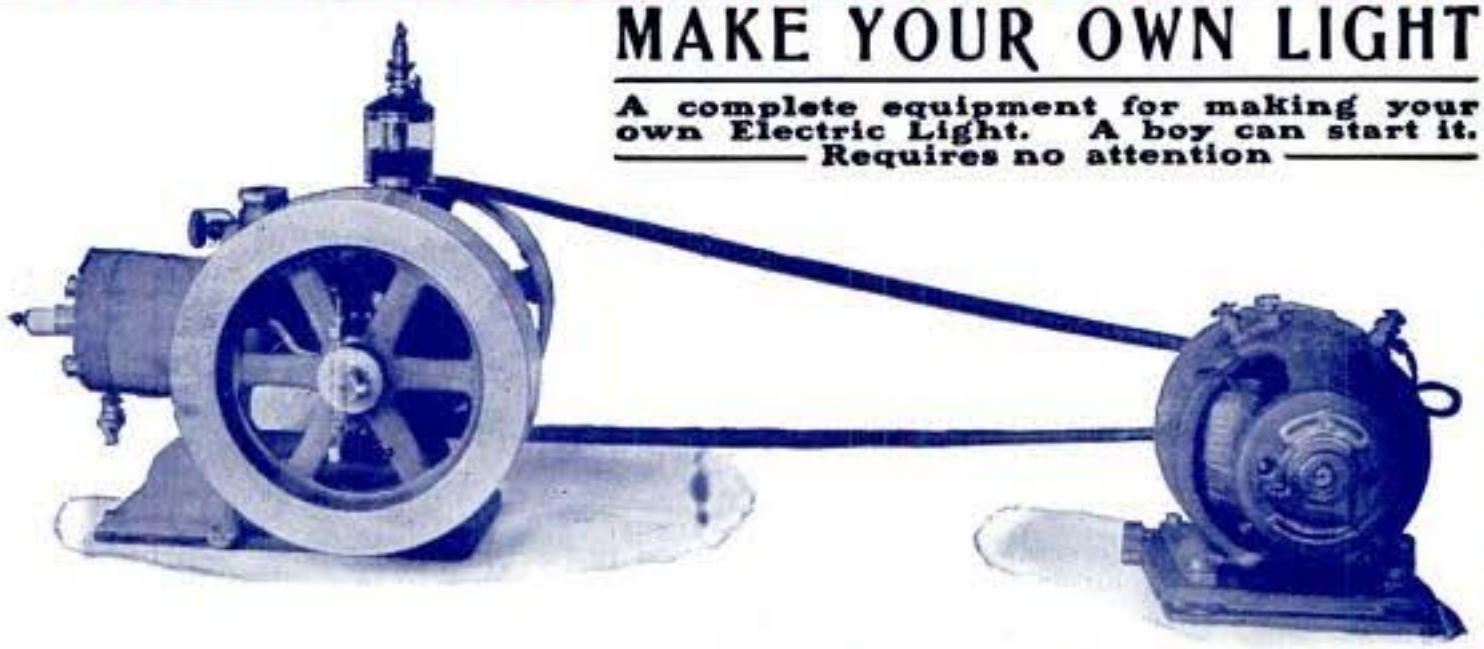
A complete equipment for making your own Electric Light. A boy can start it.
Requires no attention



¾-h. p. Gasoline Engine, 6 Light Generator, 200 feet Covered Wire, 36 feet Lamp Cord, 6 16-Candle Power Lamps, 6 Sockets, 6 Rosettes, 6 Porcelain Tubes, 50 Porcelain Knobs, 2 feet Cir. Loom, 1 Switch Fuse, Solder and Tape. The above complete and perfect outfit is offered at a price so low you cannot afford to burn oil. Send for descriptive circulars.

The most Perfect Small Engine Ever Built.....

STRONG DURABLE
SIMPLE POWERFUL

Mounted on solid wood base. All connections made and ready to run.

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Dear Sir:—Would you be open for an investment which will yield, with reasonable assurance, from 50 per cent to 100 per cent each year?

It will average 75 per cent—which means 6¼ per cent a month.

When I say investment, please understand that I do not mean a gambling proposition, such as stocks and grain speculation, or horse-race betting, nor anything which requires you to buy what you do not want, or sell what you have not got.

I REFER TO A STRAIGHT INDUSTRIAL PROPOSITION, which has for its commodity products produced by nature, and in turn manufactured into commercial necessities, for which the demand always exceeds the supply.

As a representative business man, I fully realize the annoyance of receiving unsolicited literature and advertising matter of unknown propositions.

Therefcre, before placing before you, in full detail, the venture I refer to, I ask your consent, and for that purpose I attach this coupon, which explains itself. If agreeable, and you are open for a proposition which will produce all that I claim, kindly sign and mail it.

THIS COSTS YOU NOTHING BUT THE POSTAGE, AND PUTS YOU UNDER NO OBLIGATION.

In closing, permit me to say, that the men at the head of the corporation which I represent are men of great wealth and undisputed commercial integrity.

There is not a single questionable feature in the entire plan.

May I hope to hear from you by return mail?

Very sincerely,

L. C. WELTON, 59 Clark St., Chicago.

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Dear Sir:—You may send to my address full details of the proposition you refer to. I will carefully consider the matter, and, if interested, will write you further. This with the distinct understanding that I am under no obligations.

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BY THE BROOKS SYSTEM

BROOKS SYSTEM

IF you can drive a nail and cut a piece of material from a full sized pattern you can build a Canoe, Rowboat, Sail Boat or Launch in your leisure time at home, and the building will be a source of profit and pleasure.

All you need is the patterns, costing from $2.50 up and materials from $5.00 up. The tools are common in every household. Patterns of over forty styles and sizes, all lengths from 12 to 55 feet.

The Brooks System consists of exact size **printed paper patterns** of every part of the boat, with **detailed instructions** and **working illustrations** showing each step of the work, an itemized bill of **material** required and how to secure it.

Over six thousand amateurs successfully built boats by the Brooks system last year. Fifty per cent. of them have built their second boat. Many have established themselves in the boat manufacturing business.

Catalog and particulars **FREE.** For 25 cents a 100-page catalogue, containing valuable information for the amateur yachtsman, showing several working illustrations of each boat, and a full set for one boat. Full line in knock-down and completed boats. When so ordered, patterns are expressed, charges prepaid, C. O. D., to allow examination.

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Originators of the Pattern System of Boat Building

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Here is just what you need—a

Good, Durable Pocket Knife

which embodies the following

EIGHT ADDITIONAL —TOOLS—

Alligator Wrench, Wire Pliers, Wire Cutter (will cut barbed fence wire), **Hoof Hook** (can also be used for a packing hook about the engine), **Screw Driver, Screw Bit, Swedging Awl, and Leather Punch.** The blades are tempered to withstand hard usage and are made of the best 85 carbon cutlers' steel.

These tools are needed almost every day, and you cannot afford to be without them.

Price $1.25 Postpaid.

Do not delay but send your order TODAY

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Devine Specialty Co.

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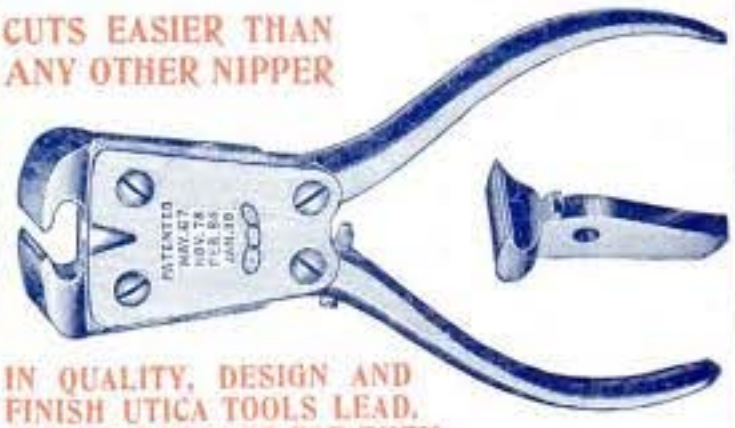
Utica Compound Nipper

The only Compound Nipper that has stood the test of years, forged from Tool Steel

ALL PARTS GUARANTEED

In construction it is simple and there is nothing to get out of order. If a part becomes worn out it can be renewed, thereby saving the cost of a new tool

CUTS EASIER THAN ANY OTHER NIPPER



IN QUALITY, DESIGN AND FINISH UTICA TOOLS LEAD. ASK YOUR DEALER FOR THEM

If he does not carry them write us. We will send you by mail any size in this style for the following price:

SIZE	4 in.	5 in.	6 in.	7 in.	8 in.	11 in.
Price, each,	85c	$1.00	$1.30	$1.50	$1.75	$2.00

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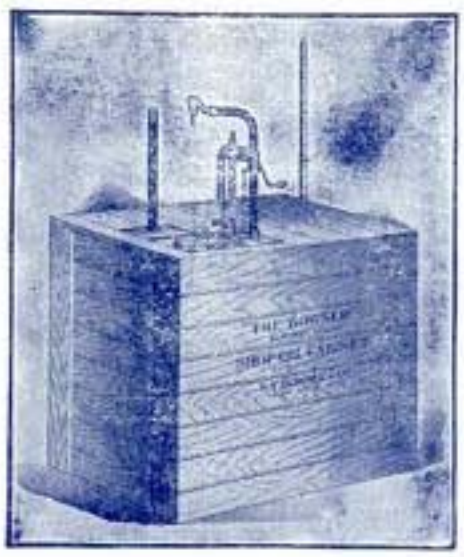

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